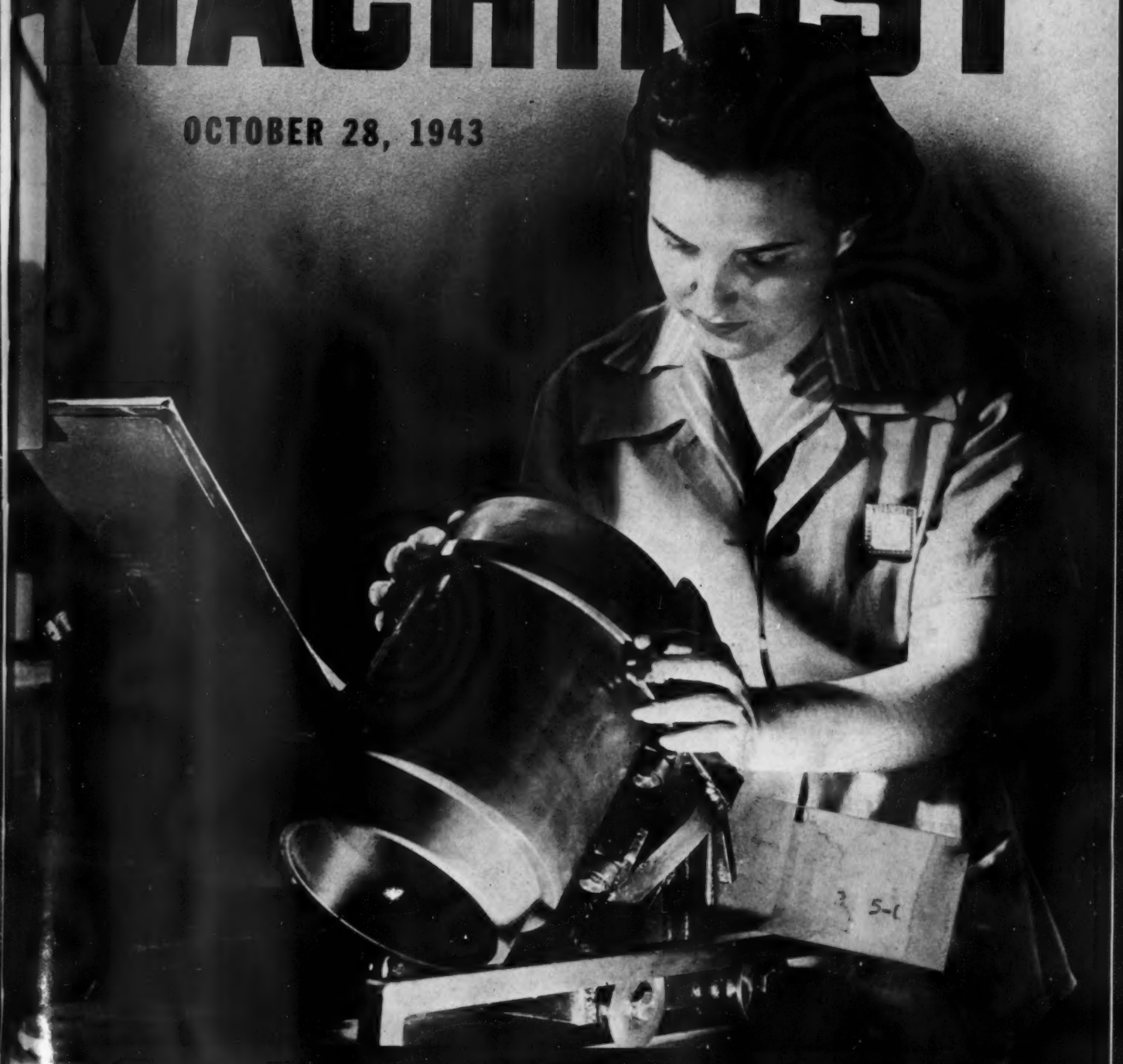
AMERICAN MACHINIST

OCTOBER 28, 1943



Teaming Handling Devices With Women – Page 109

1200 HORSEPOWER
Rides On
6 MILLIONTHS of an inch

An army travels on its stomach, but our bombers and fighters do literally fly on their bearings. Aircraft master rod bearings, therefore, are tremendously important . . . failure must not occur . . . consequently specifications are rigid, so rigid that finishing presented a pressing wartime problem to the manufacturer.

Surface finish was of primary importance — was vital for bearings to stand up continuously under the merciless buffeting of 1200 and more whirlwind horsepower. Six microinches, the specifications called for, six millionths of an inch. Design, too, specified a very difficult contour bearing surface, with tapers at either end and a straight section between. And accuracy also had to be close, to .0002".

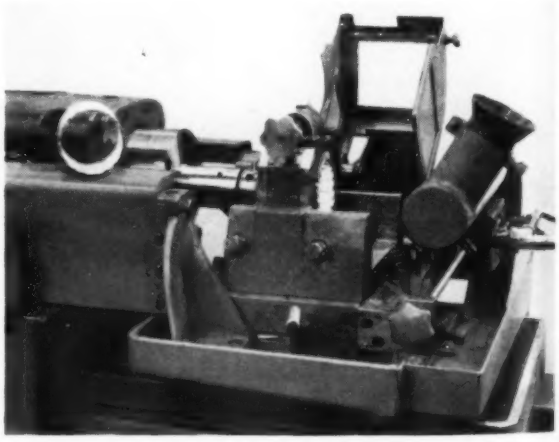
HEALD ENGINEERING was called in . . . and solved the problem. This was a special Heald Bore-Matic arranged with a cam operated contour boring head for boring straight and tapers in a single uninterrupted cut . . . with ingenious refinements in machine design which so completely reduced vibration and thermal expansion that ultra finishes of 4-6 microinches could be produced. Today, a total of 19 Heald Bore-Matics are in production on these bearings in one plant alone.

Have you a wartime problem or do you need assistance in post-war planning? If it involves precision finishing, HEALD ENGINEERING is available, now, to help you.

The HEALD Machine Co., Worcester Mass., U. S. A.

Silver bearings of this type have done much to keep aircraft flying longer, fighting longer. For ultra precision, bearings are borized — to .0002" accuracy, 6 microinches finish.

Precision plus production in finishing aircraft bearings were both achieved with the development of the specially arranged Heald No. 47A Bore-Matic shown below. Machine features include a special contour boring head for boring straight and taper bearing surfaces in the same cut; many design refinements for obtaining surface precision of 4-6 microinches. The Bore-Matic handles both full round and split bearings.



For More Precision Faster, bring your problems to Heald

American Machinist

October 28, 1943

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—chips

Gag . . . *Our old friend Harvey Byers is known to many in grinding wheel circles. A lot of us also know and appreciate Harvey's deft and prolific handling of stories. Those who haven't had the pleasure can tuck this one away as a mild sample:*

Advice to a sweater girl in a war production plant—

If your sweater is too large, look out for the machines.

If your sweater is too small, look out for the wolves.

(Apologies to the Grinding Wheel Ass'n for swiping this from one of their chit-chat bulletins.)

o

With a Grain of Salt . . . Our forte isn't higher economics, so you'll pardon us for being brought up short by a recent pronouncement of International Salt Company. Seems that there is a relationship between salt production and industrial activity . . . whereby ISC projected their sales for three years after the war and then deduced that we would enjoy high industrial production in the third year. We're not arguing or being skeptical . . . just slightly dazed. It is said to have been all worked out by a formula accurate within 3% in the past.

Would the formula also disclose, do you suppose, our income tax at that time?

o

You Don't Say! . . . *Perhaps you read the recent report that the Japanese machine tool industry is to be reorganized on mass production lines. Seems that their proposed expanded war production program is endangered by deficiencies in machine tools.*

So sorry, Tojo. It's just one more thing at which Yankees can beat you.

o

Please, Please! . . . The staff of *American Machinist* puts in many hours a day answering assorted requests for facts and figures on Metal-Working. Any publication serving an industry for 66 years naturally should be looked to for information on that industry. But, to use one of our favorite expressions, there's a limit to blind loyalty . . . and a point beyond which a mere publication cannot be expected to go.

To wit: The other day a man called up to get a list of all the machinery and other equipment used in making automobile parts. The best we could do was to recommend our "Where-to-Buy Directory," listing *all* the supply sources of all Metal-Working equipment . . . for there are few tools or supplies *not* used in making cars.

The same day a man came in asking for an up-to-date list of all makes, all sizes and all types of machine tools. Wow! The person who has such a list will please come pronto to *AM* headquarters. We'll incorporate him and make a million.

Don't mistake us . . . we encourage reasonable requests for information and often turn handsprings to fill even unreasonable ones. Something like 10 a day are answered in New York alone.

But please . . . not ones like the above.

o

Lots of Help . . . *The other day we had occasion to remark on a fact which may be of interest to you. Many readers write us, and tell us, that they read our advertising pages today more intently than ever before. This is an indication of the balance between "need for information" and the "supplying of facts." The demand for Metal-Working know-how was answered by 701 display advertisers in 1942, and the total will be much higher for 1943. Men wouldn't write, men wouldn't read, if such a pressing demand for the exchange of information didn't exist.*

o

Aloha . . . Nestled in one of those censor-opened envelopes the other day came an *American Machinist* coupon for a copy of "How to Run a Drilling Machine."

Now this wasn't strange, as we have received thousands of such. But it came from W. Tsuchiyama of Kahului, Hawaii. And the coupon we could hardly read, for it was smudged. On the envelope was "Damaged by sea water at San Pedro, Cal."

You know, with that combination we began to imagine the darndest tales of sabotage and secret moonlight sinkings . . . until our secretary brought us back to earth with the prosaic comment that some stevedore probably just let the mail sack slip over the side as he was unloading it.

Nuts. That's probably right, too. We must be just an incurable romantic.

o

No More Armament Books . . . *Seems we have mentioned it before, but in view of some recent requests it might be appropriate to repeat that* AM's *by-now-famous series of armament books are out of print. They* were: *"Plane & Engine Manufacture," "Gun Manufacture," "Artillery & Small Arms Ammunition."*

We do, however, have most of the individual Armament Sections from whcih the books were compiled, and will send them on request. They are 15c each.

o

Apron Shift . . . Columbus, Indiana, recently started an "apron shift" for housewives who can spare but half a day at a time away from home. May be a way to help tap the potential force of 1,390,000 women over 45 who last year expressed a desire to work.

o

Aircraft Data . . . *Well over a hundred top production officials of aircraft manufacturing plants have asked for reprints of a 3-part series by C. L. Fenn, Edo Aircraft, on form blocks and stretch presses. We have practically none of these reprints left, but if you're particularly interested in aircraft manufacturing practice we'll be very glad to put your name on the list to receive future reprints on the subject. Just drop us a line.*

o

Too Good? . . . On a recent swing through a number of Metal-Working plants, talking to readers and finding out some of their current problems, we got quite a kick out of the wry comment of one production manager. His outfit formerly made dredging machinery, now is turning out engines for Liberty ships. "Our men have learned to work to such close tolerances," said he, "I'm afraid I'm going to have quite a problem getting them back to their old standards, which don't have to be as fine."

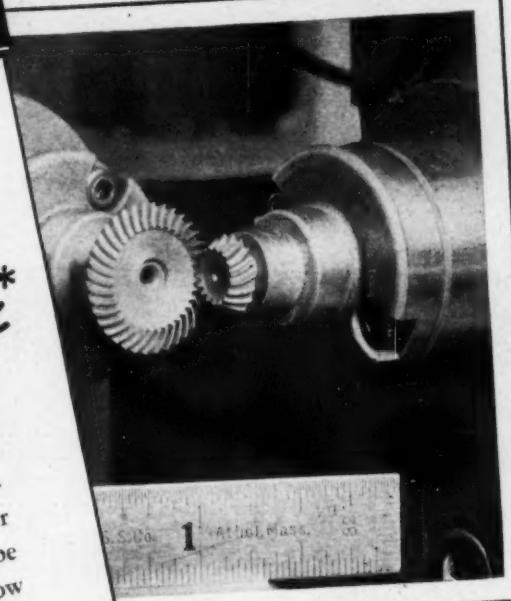
MEMO

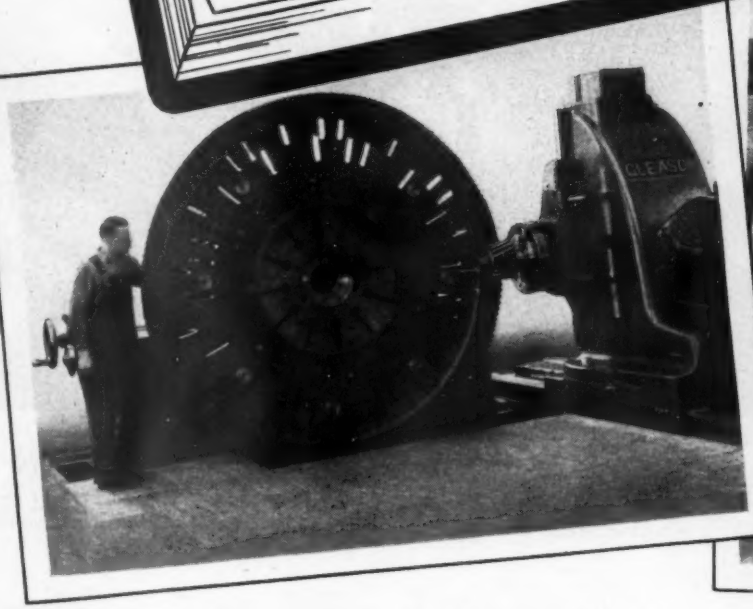
Don't Forget— Bevel Gears Range from 3/16" to 100" diameter*

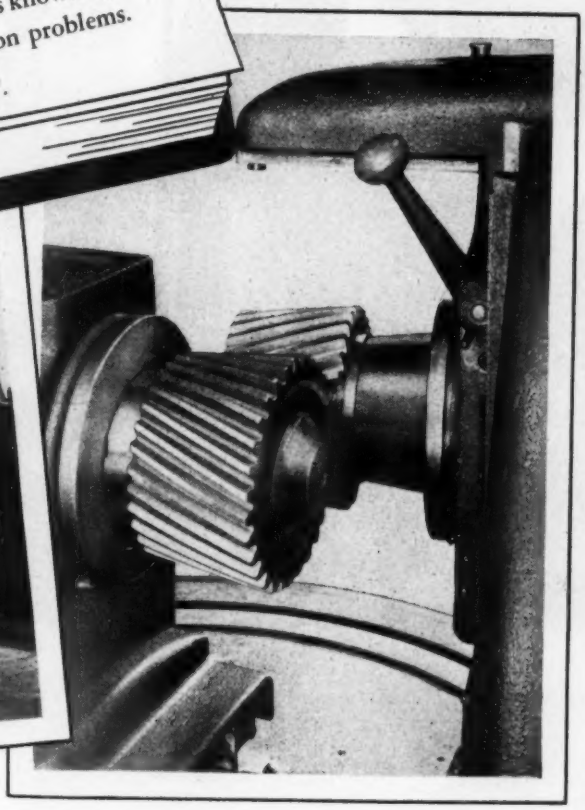
Bevel gears are not limited to any particular sizes or loads, but are universal in application. The widening scope of bevels has been amply demonstrated by a multitude of war time uses, ranging from delicate instrument parts to heavy boring-mill drives. Wherever power must "turn a corner" — bevel gears may be found in operation. No matter how small or how large the job, how slow or how fast, how lightly or heavily loaded — bevel gears can be designed for the particular application — and there will be a Gleason machine to cut them!

The Gleason Works offers over 75 years' experience in the design and manufacture of bevel gears and the machines which make them. Let us turn this knowledge to the solution of your power transmission problems.

*Straight bevel gears can be made up to 192".







GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

Somewhere in England. Milling an aircraft engine block on a CINCINNATI Dial Type Milling Machine. Notice how easily the operator controls the machine from the rear, the only place where visibility is unobstructed.

Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded February 23, 1943, and the third star September 27, 1943.

THE CINCINNATI M

MILLING MACHINES

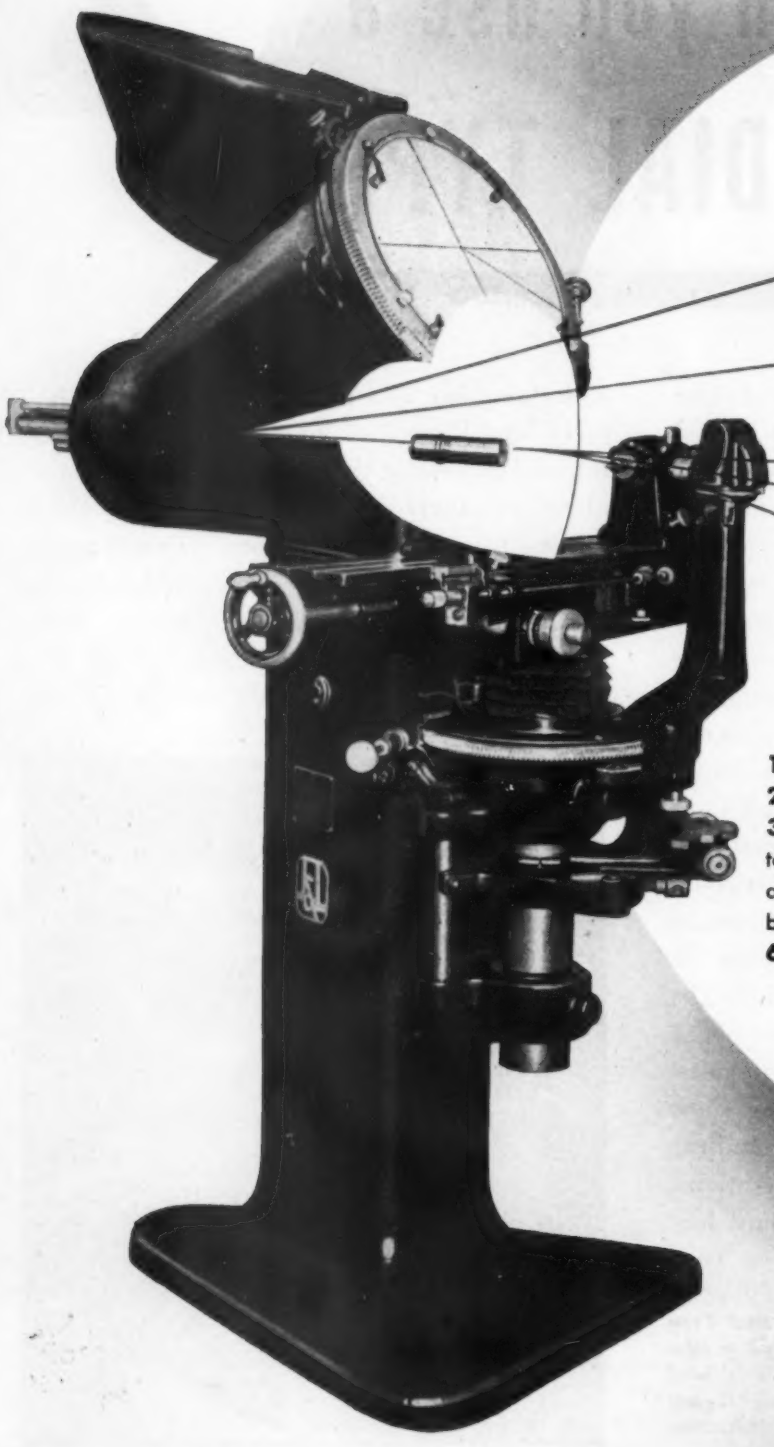
spots— when you use a CINCINNATI DIAL TYPE

Many types of work obstruct the normal view of the cutter as effectively as a stone wall. And if all the controls are at the "normal" or front operating position, the operator finds himself at a distinct disadvantage in turning out his best work. He has a ready excuse for spoiled work and broken cutters, for he can't possibly see the cutting action without leaving his control station. It's unnecessary and unfair to expect perfect work from any operator under these conditions. ¶ CINCINNATI Dial Types overcome this difficulty. Complete Dual Controls, including those for *power speed and feed changes*, are responsible for: (1) Maximum visibility. (2) Far less spoilage . . . it would be just too bad if the operator, because he couldn't see, spoiled a workpiece such as the one illustrated. (3) Greater accuracy. (4) A reduction in operator fatigue. (5) Increased production . . . actual time studies show that Dual Controls cut set-up and handling time as much as 50% on certain operations. ¶ So, one good reason why you should buy CINCINNATI Dial Type Millers for your manufacturing and general shop use is Complete Dual Controls. Another reason is Power Rapid Traverse in three directions. There are plenty of others because all features of these unusually versatile milling machines will prove beneficial. ¶ Talk over your problems with the engineers here at Milling Headquarters. Put the knowledge and experience of this group of authorities to work for you NOW!

At the right is a CINCINNATI No. 3 Plain Dial Type Milling Machine. Complete specifications are given in catalog M-970-2. Copy will be sent on request. For a brief description of the entire CINCINNATI Line, we suggest you look in Sweet's Catalog File for Mechanical Industries.

MILLING MACHINE CO. CINCINNATI, OHIO, U. S. A.

• BROACHING MACHINES • GRINDING MACHINES • LAPPING MACHINES



R FOR

on

Advantages of Jones & Lamson Optical Comparators

1. Machine operation can be learned in minutes. . . **2.** One of the fastest inspection methods known. . . **3.** Permits study of tool wear and hardening distortion. . . **4.** Permits taking advantage of full allowable tolerances. . . **5.** Enlarged shadow can be studied by several persons at same time. . . **6.** Enlarged shadow can be photographed.

HEART TROUBLE

optical inspection equipment!

The lens system is the *heart* of every optical inspection machine. Without perfection in this system—without special lenses, precision cells and housings—without optically flat mirrors, heart trouble results. This means distortion, fuzzy edges, and prismatic colors on the shadow image—inspection that is *fatal* to production.

Your protection against heart trouble is the **Jones & Lamson Optical Comparators.** For the lens system of each machine is literally prescription-designed by Jones & Lamson inspection engineers and built to those specifications by their own craftsmen. This highly specialized lens system, so necessary for inspection by optical projection, is your guarantee of trouble-free performance. The shadow image on every **Jones & Lamson Comparator** is dark, clear and sharp. It is absolutely accurate over the *entire* chart glass. The light around the image is entirely free from prismatic coloring.

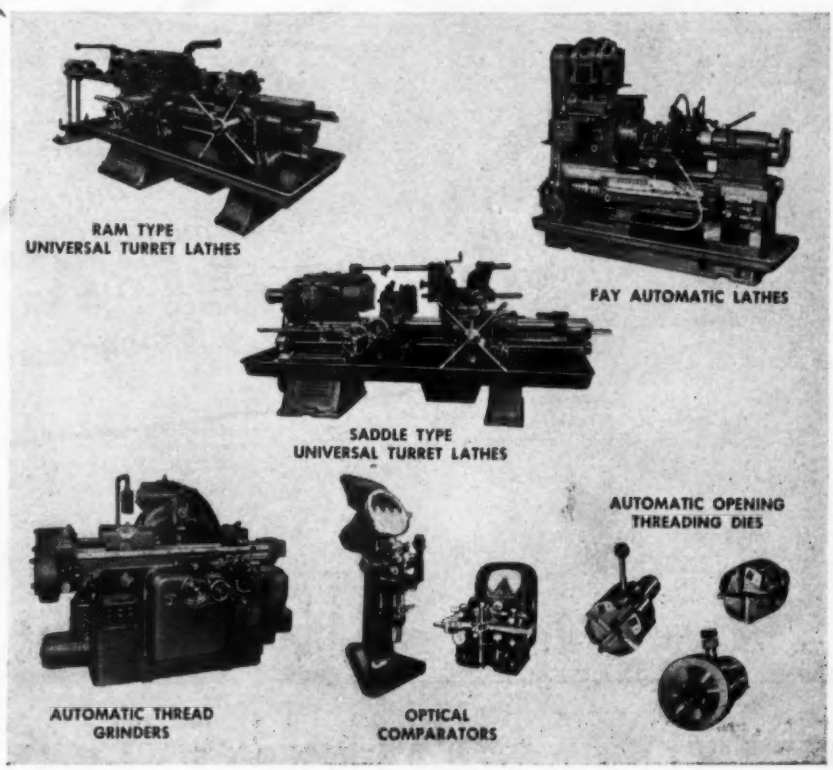
For accurate, rapid, economical inspection . . . BEYOND A SHADOW OF A DOUBT!

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturers of:
Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies

PROFIT-PRODUCING MACHINE TOOLS



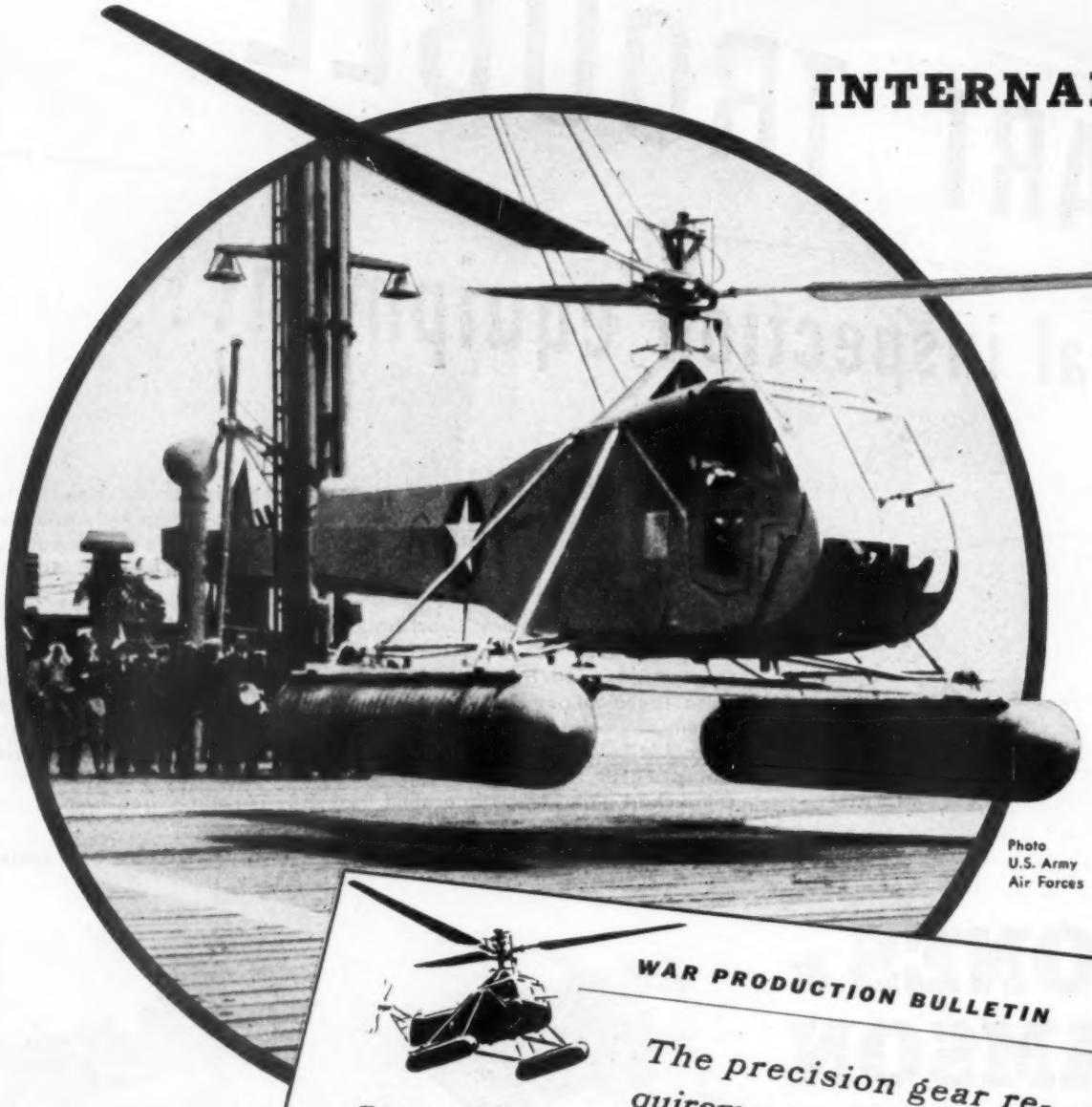


Photo
U.S. Army
Air Forces

WAR PRODUCTION BULLETIN

The precision gear requirements of aviation's newest submarine-killer have called, once again for FELLOWS GEAR SHAPER manufacturing equipment.

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTIO

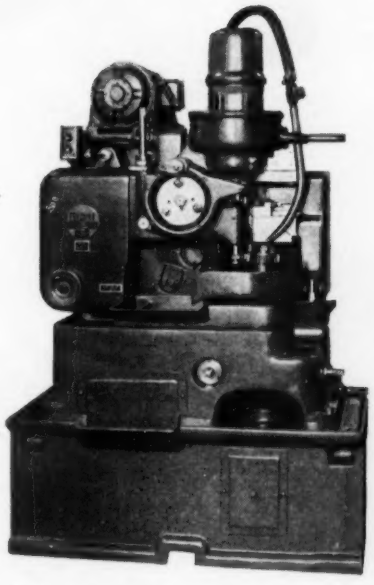
AND EXTERNAL Helicals FOR Helicopters...

CUT ON THE FELLOWS GEAR SHAPER

The helical gears to which reference is made are both internal and external — and of a size which adapts them to generating on the 7-type Fellows Gear Shaper. Fixtures have been laid out for handling their cutting on a production basis. The war need for *helicopters* in quantity is of immediate urgency.

So, the newest member of the aviation family joins the pursuit planes, bombers and lighter-than-air craft in giving Fellows-cut gears a chance to prove that initial high-precision means not only more flying hours before check-up, but greatly prolonger total life.

In the cutting of gears to exact precision specifications, Fellows Gear Shapers tooled with Original Fellows Cutters is today, more than ever, a means to production economy. The versatility with which cutters and fixtures can be adapted to meet special requirements is of definite advantage. For catalog data or special information, write: The Fellows Gear Shaper Company, Springfield, Vermont — or 616 Fisher Bldg., Detroit, or 640 West Town Office Bldg., Chicago.



Fellows
7-type High Speed Gear Shaper

Method

. . . . FROM BLANK TO FINISHED GEAR

DID YOU KNOW YOU CAN GRIND *Rubber*

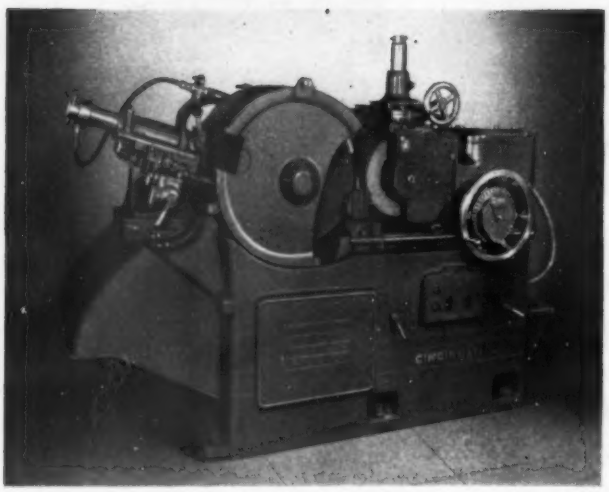


Illustration shows front view of standard CINCINNATI No. 3 Centerless Grinding Machine.

Many non-metallic materials — including those which are now substituting for steel — can be finished to advantage by grinding on a CINCINNATI Centerless. In the illustration at the right, a section of a rubber roller is centerless ground at greatly increased production, the machine turning out 4 pieces per minute for rolls 3″ x 12″, and 6 pieces per minute for rolls 2¼″ x 12″. On this operation, a crepe or rough finish was specified, but by simply changing the regulating wheel speed, a very smooth finish may be obtained. ¶ Parts made of hard rubber, glass, plastics, ceramics and wood may be ground to exceedingly close tolerances easily and quickly by the centerless method. The engineers here at Grinding Headquarters have adapted the centerless to many operations previously handled by other methods, and have succeeded in producing better parts faster and cheaper. ¶ This group of grinding authorities will be glad to discuss with you any problem which involves centerless or centertype grinding operations.

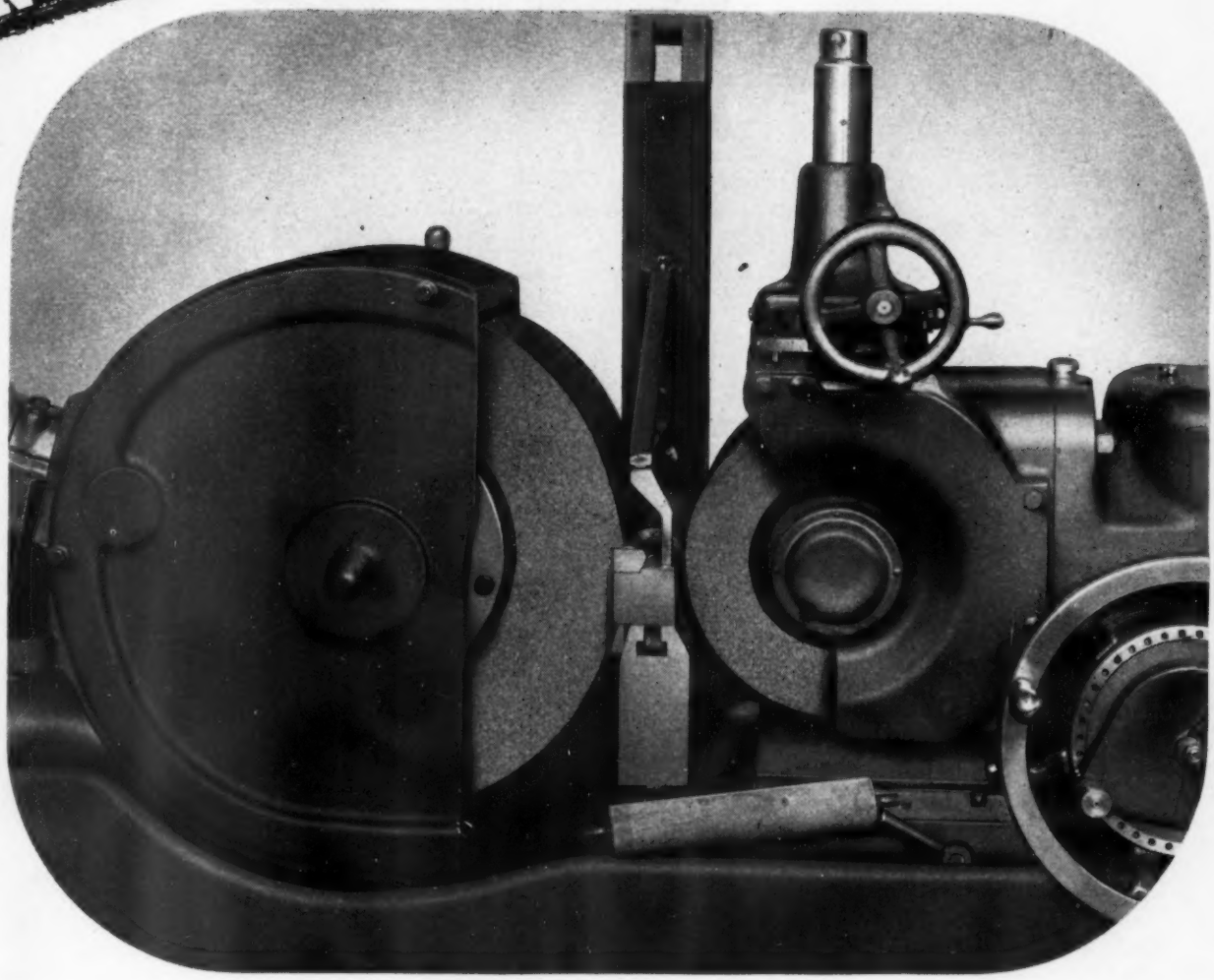
Navy E awarded March 6, 1942. Renewal star awarded August 29, 1942, along with Army-Navy E. The second star was awarded February 23, 1943, and the third star September 27, 1943.

CINCINNATI

CENTER TYPE GRINDING MACHINES

CINCINNATI

ON A CINCINNATI CENTERLESS?



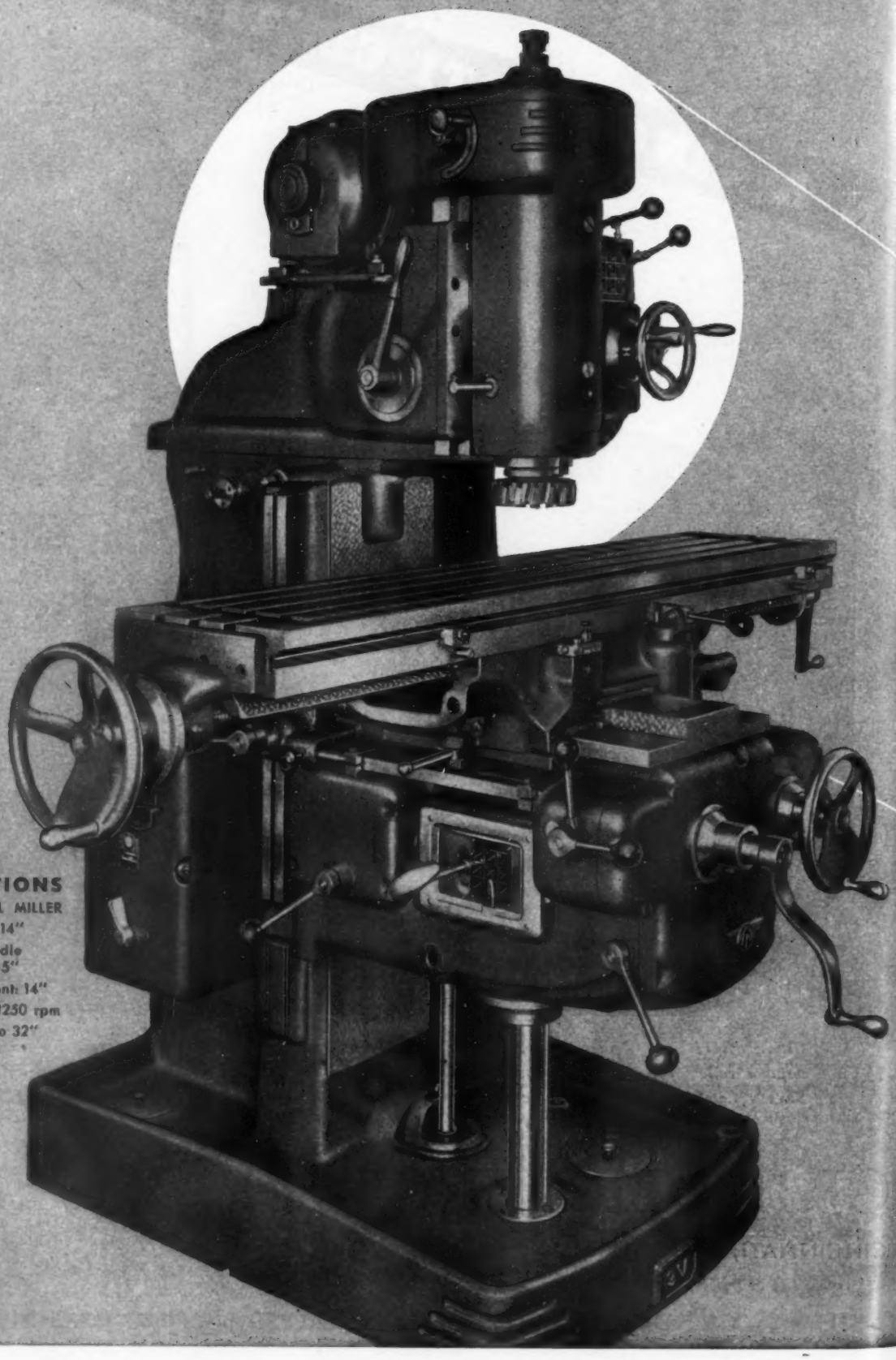
CINCINNATI No. 3 Centerless Grinding Machine arranged with hydraulic loading fixture for grinding rubber wringer rollers concentric with the journal. For a brief description of all CINCINNATI Grinders, look in Sweet's Catalog File. For complete information on the No. 3 Centerless, write for catalog No. G-438-2.

GRINDERS INCORPORATED

CINCINNATI, OHIO, U S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Adjustable Ram and

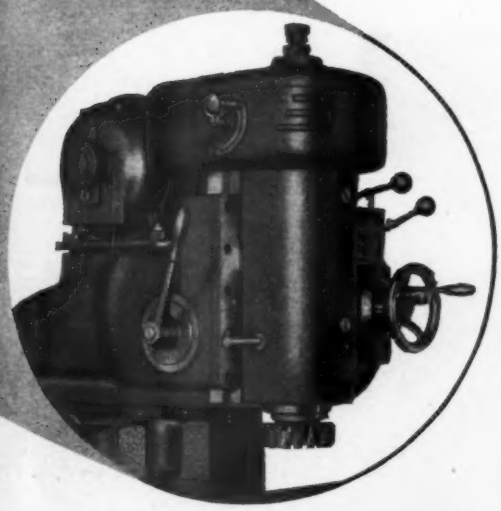


SPECIFICATIONS
No. 3V VERTICAL MILLER
Table: 64" x 14"
Vertical Spindle
Adjustment: 5"
Throat Adjustment: 14"
18 Speeds: 25 to 1250 rpm
18 Feeds: 3/8" to 32"

Spindle Assembly Increases Your Work Range

ON VAN NORMAN 3V VERTICAL MILLERS

Noteworthy of the many important features incorporated in the Van Norman 3V Miller is the adjustable vertical spindle, mounted on a sliding ram. This sliding ram permits the throat distance to be varied so that the spindle can be more closely coupled to the column . . . which means maximum rigidity that insures greater accuracy. The variable throat distance also increases the range of set-ups and work that can be handled on this machine.



Easy to Reach, Quick-Acting Controls Speed Output

Conveniently located quick change speed levers, mounted on the ram, provide 18 speeds from 25 to 1250 rpm. Vertical adjustment of the heavy spindle is quickly made with the large hand wheel. 4 position dial indicator stop for step milling can be mounted on the front of the ram unit. Heavy sliding ram is easily positioned by means of crank on left side of column, and is solidly locked by cam-type gib clamps. In addition, the front and rear directional controls of power feeds, rapid traverse for table, knee and saddle provide ease of operation and help to increase output.

Van Norman Milling Machines

ARMY E NAVY

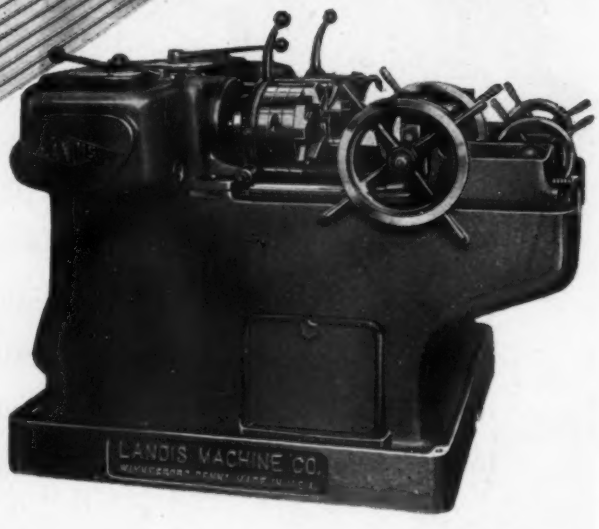
VAN NORMAN COMPANY, SPRINGFIELD, MASS.

LANDIS THREADING EQUIPMENT PERFORMANCE

Landis Threading Equipment Will Give You Maximum Threading Production

The Landis Chaser

The Landis Threading Machine



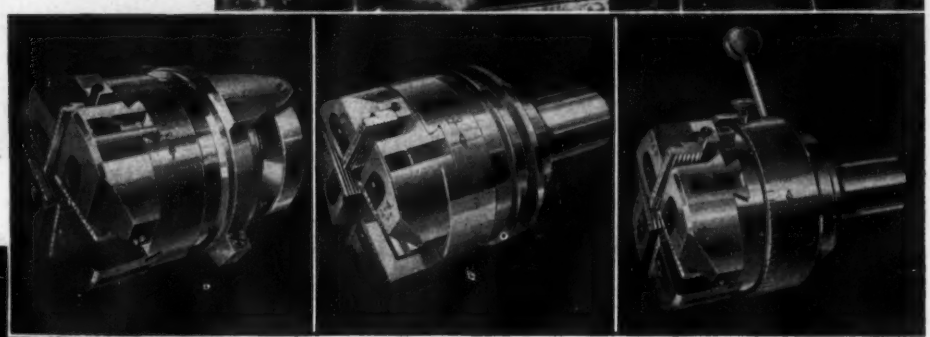
Threading alloy steel studs, 28 linear feet are produced per hour by employing Landis long-life chasers as compared with 12 linear feet by a prior method. Furthermore, an average of 15 bars—more than 5 hours' continuous production—are threaded before the chasers require regrinding.

Send for Descriptive Booklets on

LANDIS MACHINE COMPANY

IS DAILY SETTING NEW RECORDS

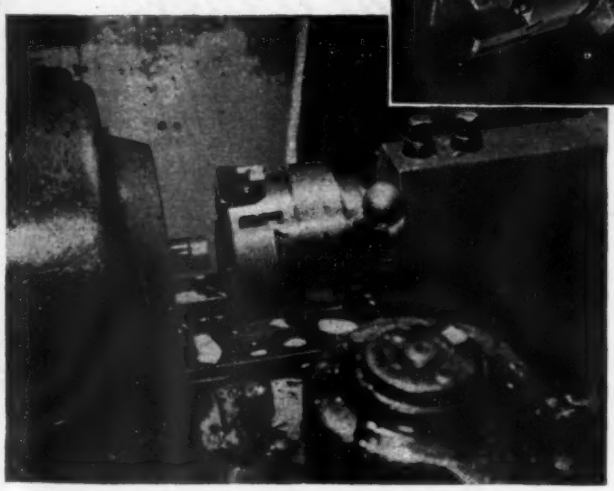
Landis Threading Equipment Will Give You Maximum Threading Accuracy



The LANCO Head for Hand Operated Machines.

The LANDEX Head for Automatic Screw Machines.

THE LANDMATIC Head for Turret Lathes.



Threading a steel forging with the Landmatic Die Head in one pass, where formerly two passes were required, thereby cutting production time in half.

Landmaco Threading Machines and Die Heads

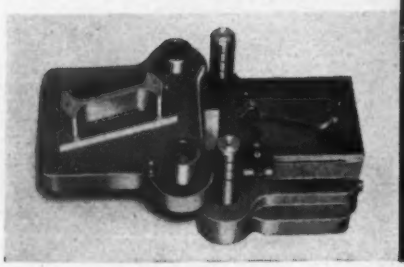
WAYNESBORO, PENNSYLVANIA, U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

"One of the most Outstanding Machines I've ever seen"

JOHN W. RIX, *Mfg. Engineer*
Cessna Aircraft Co.

The Milwaukee Rotary Head Milling Machine "Under Fire" At Cessna



On tools like these no layout was required. All machining was done by working to "dial" graduations. Direct measurements were eliminated.

Proof That This Machine *"Has what it takes"*

Is Found In Mr. Rix's Statement:

"I consider the Milwaukee Rotary Head Milling Machine to be one of the most outstanding machines I've ever seen for tool room work. It paid for itself in the first few months of operation. We have repeatedly accomplished feats which I would not have believed possible if I had not seen them myself."

(signed) JOHN W. RIX

Since purchasing their first Milwaukee Rotary Head Milling Machine, Cessna Aircraft has milled hundreds of complicated blanking dies of geometrical form. Furthermore, they milled the punches to fit these dies with .001" clearance in between without resorting to hand fitting of any kind.

This meant that the punches and dies were heat-treated at the same time. Then, after surface grinding, they were ready for mounting on the die set.

The Milwaukee Rotary Head Milling Machine is without equal in the high speed, accurate, economical production of dies, molds, hobs, as well as the precision machining of many parts. In a single set-up, it performs layout, milling, drilling precision boring and slotting operations—mills circular and angular cuts in both vertical and horizontal planes.

The "Machine of Tomorrow" — here today!

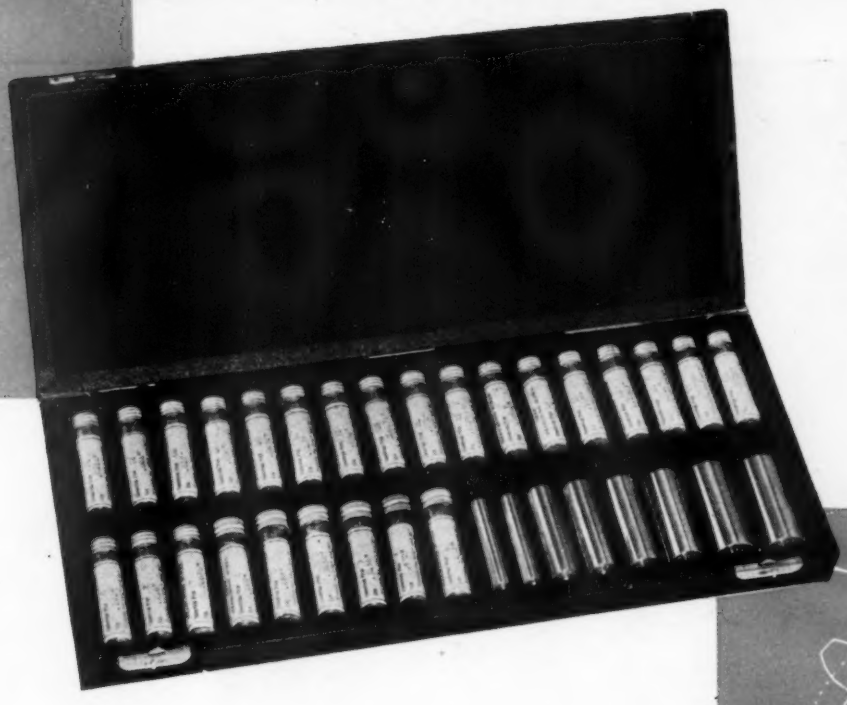
As a leader in your field you should have the complete story on the Milwaukee Rotary Head Milling Machine and its remarkable, low-cost performance. Write for Bulletin 1002A.

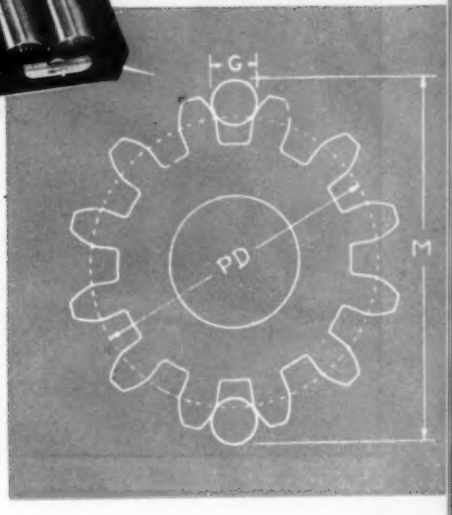
Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

Set No. 26 External Gear Measuring Wires for use with new simplified gear measuring system.





SIMPLE, RELIABLE, SUPER-ACCURATE!

Van Keuren GEAR MEASURING SYSTEM

Simple! . . . The only calculation required is one of simple division.
Reliable! . . . The system is based on formulas approved by the American Gear Manufacturers Association.

Super-Accurate! . . . Van Keuren Gear Measuring Wires are accurate to within 25 millionths of an inch for roundness and exact size.

Van Keuren gear measuring tables give the measurements (M) over the wires (G) for 1 diametral pitch gears of correct pitch diameter (PD). The only calculation required is to divide the measurement for 1 diametral pitch by the diametral pitch of the gear being measured. The tables are complete for gears from 10 to 171 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. The tables provide for measuring both external and internal gears. They are far more accurate than anything previously available. No interpolations are required.

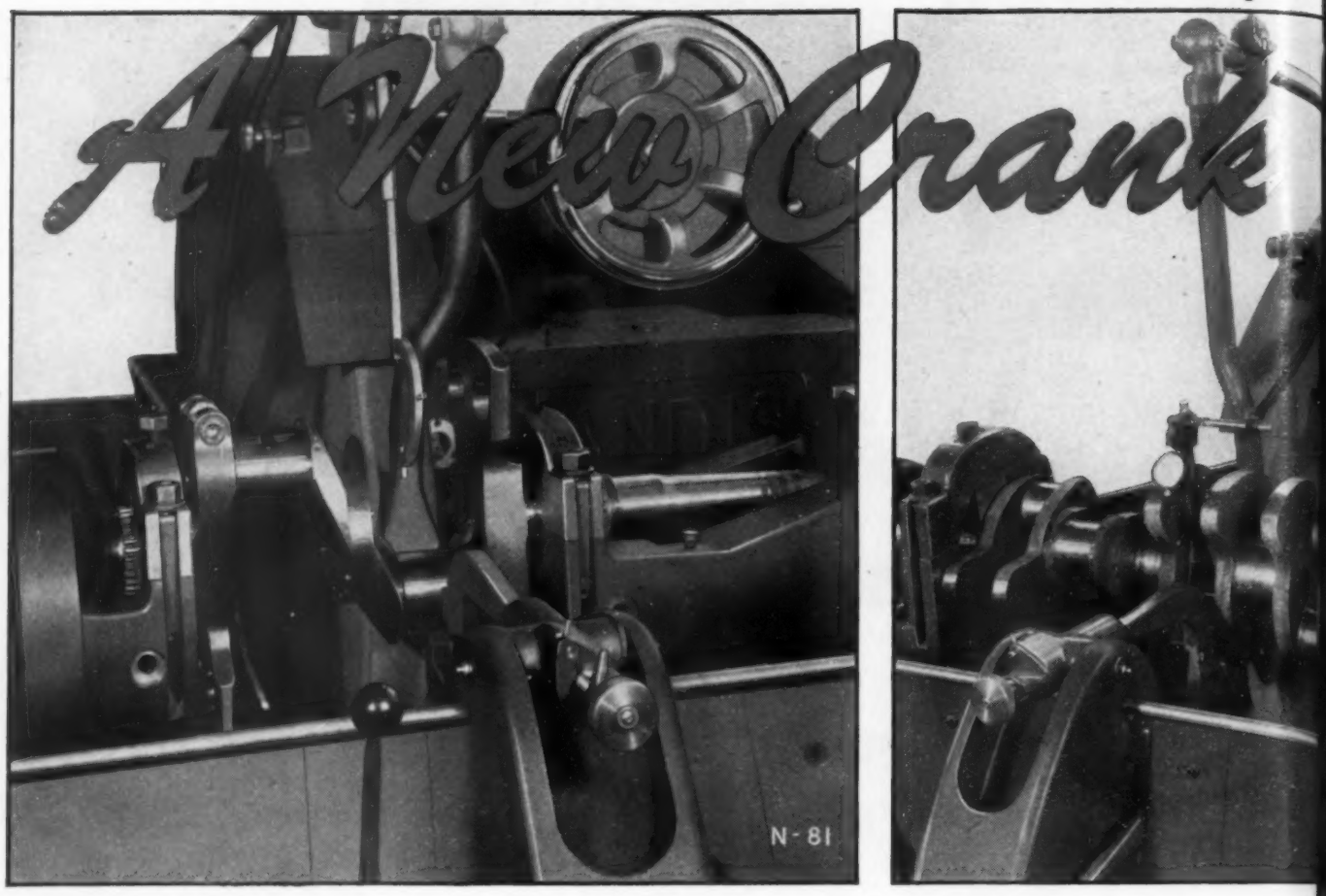
Write for catalog No. 31, giving full details, complete tables and instructions for their use.

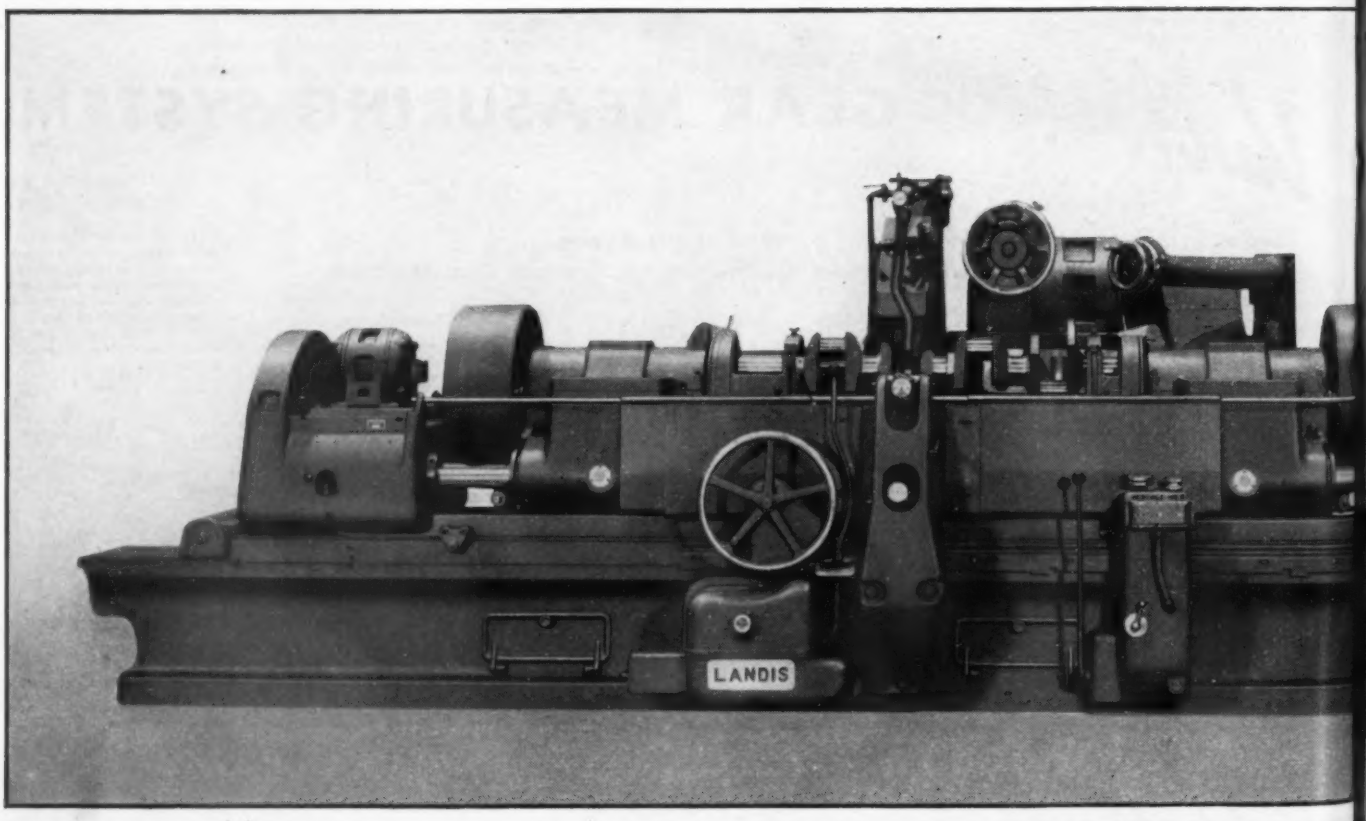
Our Catalogue No. 31 is a manual of precision measuring systems, giving complete tables and simplified formulae for measuring all standard threads, splines and spur gears. Send for this valuable handbook.

Ultimate Accuracy

THE Van Keuren CO., 24th YEAR 176 WALTHAM ST., WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles





Unusual Performance as

Pin Grinder

THE LANDIS 25" TYPE-DD

PRECISION LANDIS GRINDERS

Here illustrated is the newest Landis Crank Pin Grinder. Designated as the 25" Type DD, it is already making a name for itself in numerous large plants where the demand is for close accuracy, coupled with high output.

In the shorter lengths, the Type DD is recommended for radial engine crankshafts and for in-line liquid cooled engine crankshafts. Many of the smaller Diesel engine shafts may be handled by the longer machines.

Certain basic Landis Crank Grinder features are continued in the Type DD. The new features include:

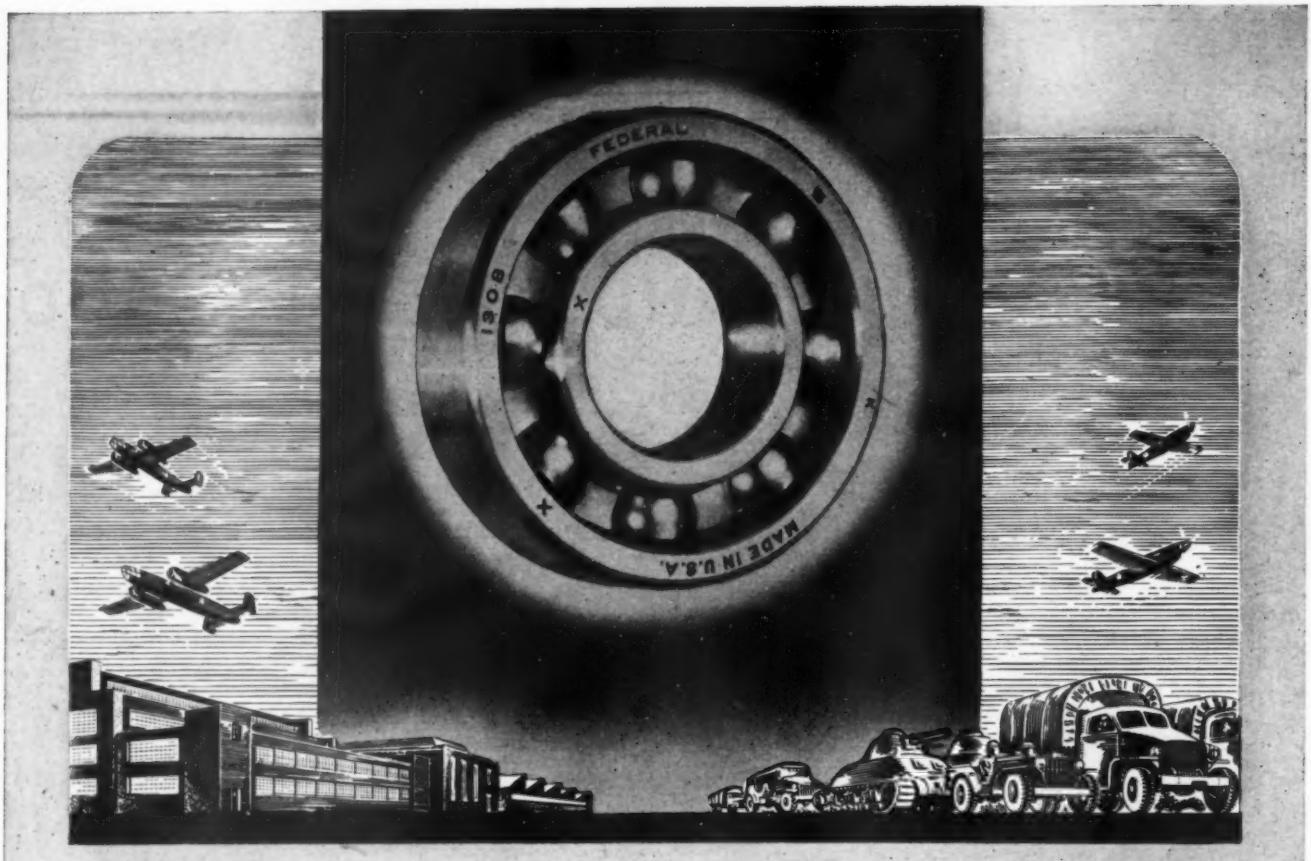
1. Dual work drive arrangement which eliminates or minimizes crankshaft axial deflection.
2. Provision for quickly and efficiently correcting any out-of-balance condition of the crankshaft.
3. Rugged 5/8" movement shoulder grinding attachment, suitable for rapid metal removal.
4. Massive bed mounted stationary work rest with quick acting shoe movement control.
5. Landis hydraulic straight infeed with 12" rapid feed, required because of the large flanges inherent in the design of some airplane cranks.

The machine to the left is a 25" x 48". Three other lengths—80", 96" and 120"—may be had. If you are a crankshaft manufacturer, write us for more information relative to the production-improving and cost-reducing possibilities of the new Landis Type DD.

415

LANDIS TOOL CO.
WAYNESBORO—PENNA.

Usual



FEDERAL BEARINGS

TRADE MARK

Federal is doing an outstanding job—in war production, in industry and in Uncle Sam's mechanized vehicles at home and abroad . . .

For the duration we are unable to supply many types of bearings formerly manufactured

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

U. S. A.

REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower • Cleveland: 402 Swetland Building

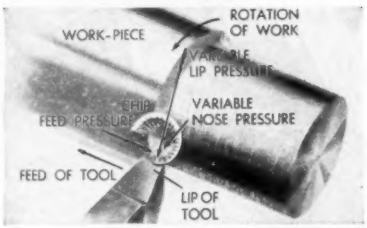
Chicago: 902 S. Wabash Ave. • Los Angeles: 5410 Wilshire Blvd.

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION

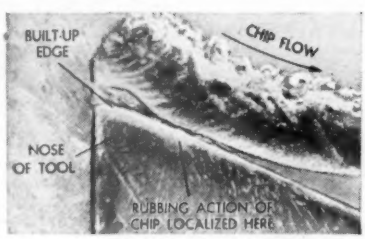
HOW TO SOLVE OPERATING PROBLEMS WITH *Correct Lubrication*

How Cutting Oil Can Increase Your Production:

1 FACTS ABOUT METAL CUTTING



The lip of a tool is an *extreme-pressure* area where the great pressures of the chip are exerted. At the tool nose and directly below the cutting edge is a *boundary area* which intermittently contacts the work-piece as the tool is deflected by the varying pressure of the chip. These microscopic vibrations create minute openings permitting a properly selected cutting oil to reach the pressure areas.



The *built-up edge* (see above) protects the cutting edge of the tool from frictional heat and excessive wear. An excessive build-up, however, results in its sloughing between tool and work-piece, thus marring the finish.

2 WHAT CUTTING OILS MUST HAVE (FOR GENERAL MACHINING)

PRESSURE RESISTANCE

Adequate pressure-resisting property in a cutting oil prevents excessive heating and wear of cutting tool and promotes smooth chip flow. RESULT: *Maximum feeds and cuts... minimum vibration... satisfactory finish.*

ANTI-WELD

Correct anti-welding property prevents excessive amount of built-up edge which can slough between tool and work, but fosters the necessary slight build-up which protects the cutting edge. RESULT: *Satisfactory finish* and *long tool life.*

LUBRICITY

Correct lubricity protects the boundary area of the tool from excessive wear. RESULT: *Long tool life... accurate size...smooth finish.*

COOLING ABILITY

Maximum cooling ability to remove frictional heat. RESULT: *Maximum speed...long tool life.*

3 PRODUCTION BENEFITS FROM USING S/V CUTTING OILS:

S/V Cutting Oils are the highest quality obtainable for the service for which they are recommended. They have a correct balance of essential cutting oil properties and their use results in...

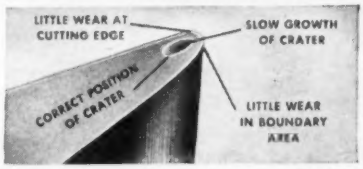
✓ **MAXIMUM CUTTING SPEEDS, FEEDS, CUTS—**
i.e., a maximum amount of metal removed per minute.

✓ **MAXIMUM PRODUCTIVE MACHINE TIME—**
i.e., minimum shut-downs for tool replacements.

✓ **MINIMUM REJECTS—**
due to poor finish or off-size

Plus

✓ **TOOL CONSERVATION**



The picture above shows the best position of the crater on the lip of the tool. It results in the need for removing only a minimum of metal per grind. If finish and tool life are satisfactory, this is the ideal condition.

ONE OF A SERIES OF SUGGESTIONS TO AID PRODUCTION

GARGOYLE Lubricants

SOCONY-VACUUM OIL COMPANY, INC.—Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Magnolia Petroleum Company • General Petroleum Corporation of California

USE S/V CUTTING OILS

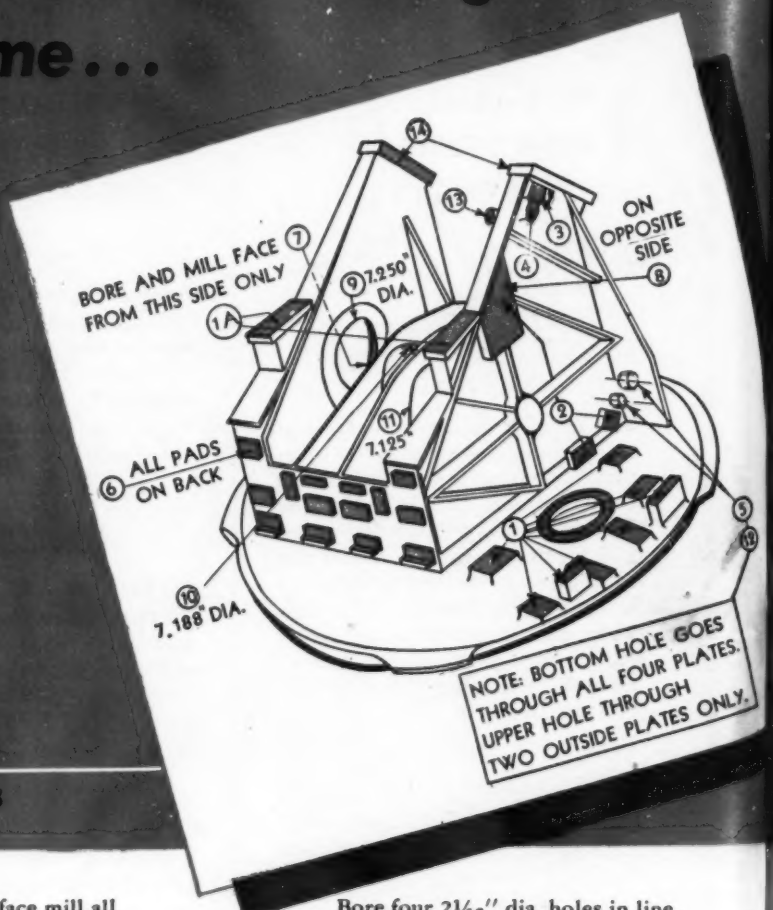
S/V VACSUL • S/V SULTRAN • S/V VACMUL

33 Pads and 9

Machined in One

with savings in both machining and handling time...

Here is another interesting example of machining a steel weldment having a number of pads and bores. The manufacturer ordinarily uses this G. & L. 360 Floor Type Machine and G. & L. Rotary Table for machining larger weldments. However, when called upon to produce a moderate number of these smaller weldments, he uses an indexing fixture of his own, placed on top of the G. & L. rotary table. This arrangement reduces overhang of the spindle to a minimum. This makes it possible to place the part on the center of the table, keeping the work close to the machine spindle.



Operation Details

(See Drawing Above)

Operation No. 1—Using right angle attachment, face mill all surfaces marked No. 1 on drawing.
2 cuts: Ruff and finish.

FIRST INDEX: 90°

Operation No. 2—Face mill pads No. 1A with right angle attachment.

Operation No. 3—Remove right angle attachment, insert face milling cutter. Ruff and finish mill all pads No. 6 on drawing.

SECOND INDEX: 90° Back to first position

Operation No. 4—Face mill. Pads Nos. 2, 3 and 4.
2 cuts: Ruff and finish.

Operation No. 5—Remove face milling cutter and insert boring bar.
Bore four 2 1/16" dia. holes in line.
2 cuts: Ruff and finish No. 5.
Bore one 2 1/16" dia. hole in outside plate only.
Ruff and finish No. 5.

THIRD INDEX: 180°

Operation No. 6—Ruff and finish 2 1/16" dia. bore, No. 12 on drawing.

Operation No. 7—Change boring bars.
Ruff bore 7.250" dia. bore No. 7 on drawing.
Ruff bore 7.188" dia. bore.
Ruff bore 7.125" dia. bore.
Finish bore 7.250" dia. bore.

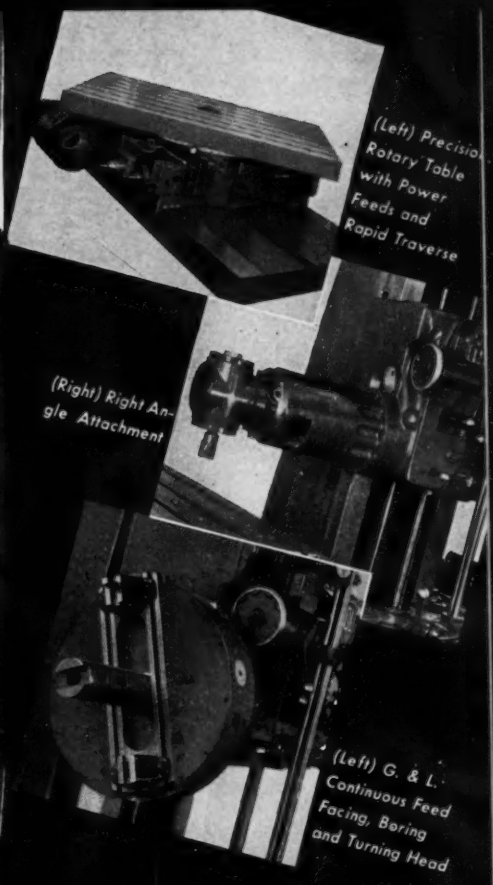
G&L

GIDDINGS & LEWIS
138 DOTY STREET

Right: G. & L. Table Type Machine.

Right: G. & L. Floor Type Machine.

Holes Setting



(Left) Precision Rotary Table with Power Feeds and Rapid Traverse

(Right) Right Angle Attachment

(Left) G. & L. Continuous Feed Facing, Boring and Turning Head

Reduce Settings and Save Time with G. & L. Attachments and Accessories . . .

The above are only three of many G. & L. accessories and attachments designed and built to increase machine flexibility and save time. If your work includes an endless variety of parts, you can use some of these attachments profitably. For instance, the Continuous Feed Facing, Boring and Turning Head makes it possible to face and bore simultaneously. Many other operations and combinations of operations not ordinarily performed with the Horizontal Boring, Drilling and Milling Machine, are possible with this attachment. Write for the G. & L. General Catalog which describes all additional time-saving devices.

Operation No. 8—Remove boring bar insert face mill.
Rough mill pad No. 8.
Finish mill pad No. 8.
Rough mill face of 7.250" bore.
Finish mill face of 7.250" bore No. 7 on drawing.

FOURTH INDEX: 90°

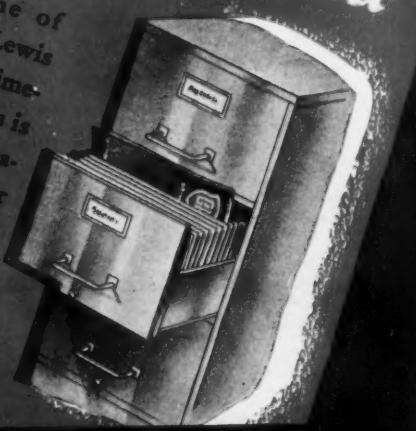
Operation No. 9—Attach right angle attachment.
Ruff mill surface No. 14.
Finish mill surface No. 14.

Operation No. 10—Ruff mill pad No. 13.
Finish mill pad No. 13.

Note: Right Angle Attachment is now in position for operation No. 1 on next weldment.

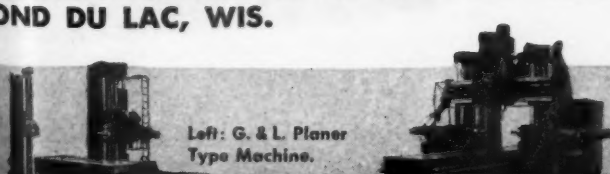
Additional Data

. . . covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today — please indicate your business connection. Ask for Bulletin 102



MACHINE TOOL CO.

FOND DU LAC, WIS.

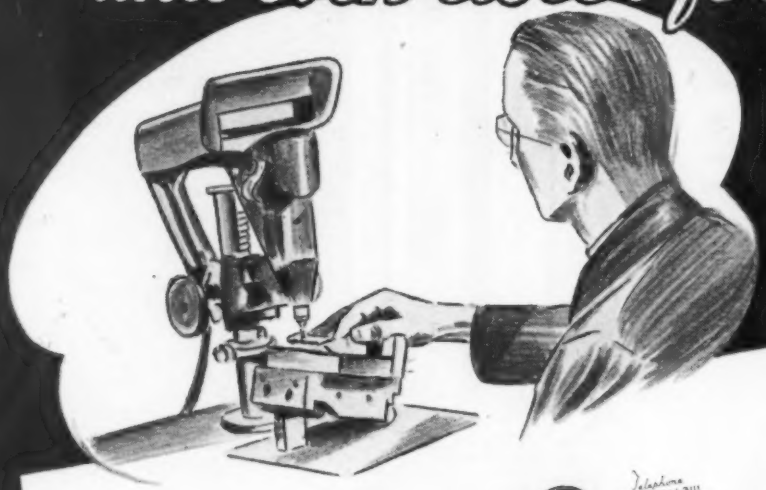


Left: G. & L. Planer Type Machine.

Left: G. & L. Multiple Head Type Machine.

PLUS NOTHING
MINUS 25 MILLIONTHS

and even closer for parallel!



MICHIGAN TOOL Company

Gear Producing and Checking Equipment - Metal Cutting Tools - Cone Worm Gears

7171 EAST Mc NICHOLS ROAD • • • DETROIT, MICHIGAN, U.S.A.

TWINBROOK 1-3111

August 14,1943.

Mr. Ralph Woodward,
c/o Norton Company,
Grinding Machine Division,
Worcester, Mass..

Dear Sir:-

In reply to your inquiry regarding the Norton lapping machine which we are using on gear finishing rack blades, we are pleased to inform you that it is functioning quite satisfactorily.

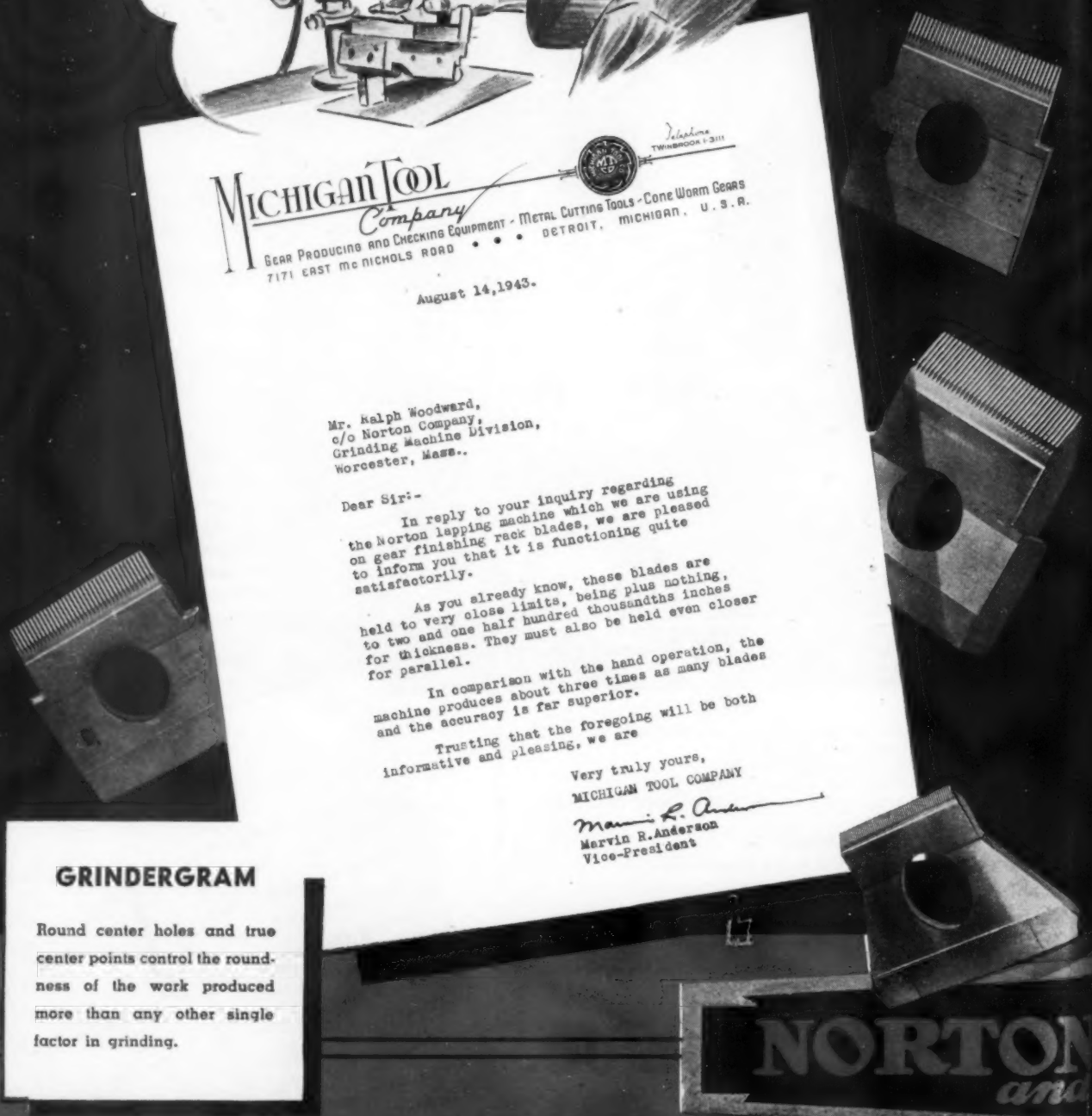
As you already know, these blades are held to very close limits, being plus nothing, to two and one half hundred thousandths inches for thickness. They must also be held even closer for parallel.

In comparison with the hand operation, the machine produces about three times as many blades and the accuracy is far superior.

Trusting that the foregoing will be both informative and pleasing, we are

Very truly yours,
MICHIGAN TOOL COMPANY

Marvin R. Anderson
Vice-President

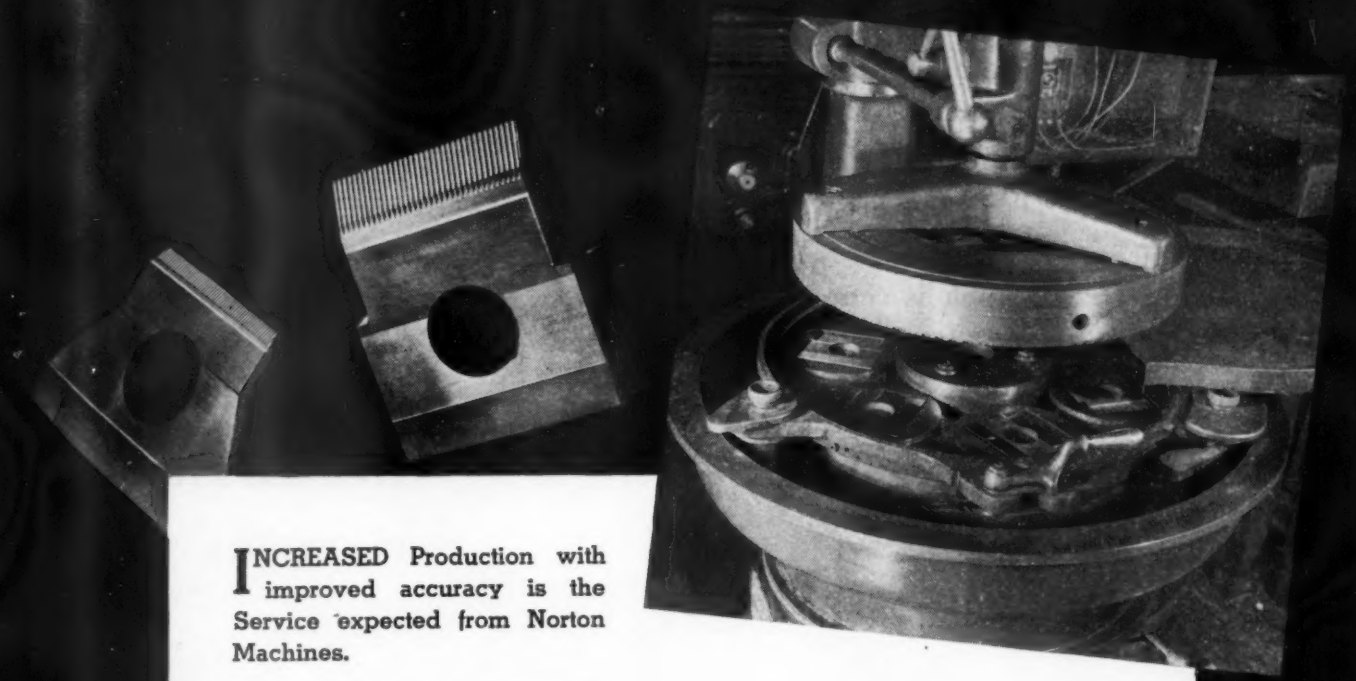


GRINDERGRAM

Round center holes and true center points control the roundness of the work produced more than any other single factor in grinding.

NORTON

and NORTON LAPPING BOOSTS OUTPUT OF GEAR SHAVING BLADES 300%



INCREASED Production with improved accuracy is the Service expected from Norton Machines.

Admittedly we are proud of machines so accurate that they finish to outside limits of one-hundredth the thickness of a human hair, very necessary limits in this case since the thickness of the gear shaving blade must equal exactly the circular pitch of the finished gear. We are also pleased that the Norton 10-U Lapping Machine gives increased production over hand-lapping — and with long lap life between truings.

But still more important is the contribution to engineering progress. Gears shaved by the rack type method give consistently improved performance. The accuracy of such gears and their quiet, efficient operation depends on the initial accuracy of the finishing tools. By the Michigan Tool Company's techniques manufacturing errors have been practically eliminated. And in this approach toward perfection the 10-U Lapper has assisted in rendering typical Norton Service.

NORTON COMPANY, WORCESTER 6, MASS.

NEW YORK CHICAGO DETROIT CLEVELAND HARTFORD

M-469

GRINDERS
Lappers

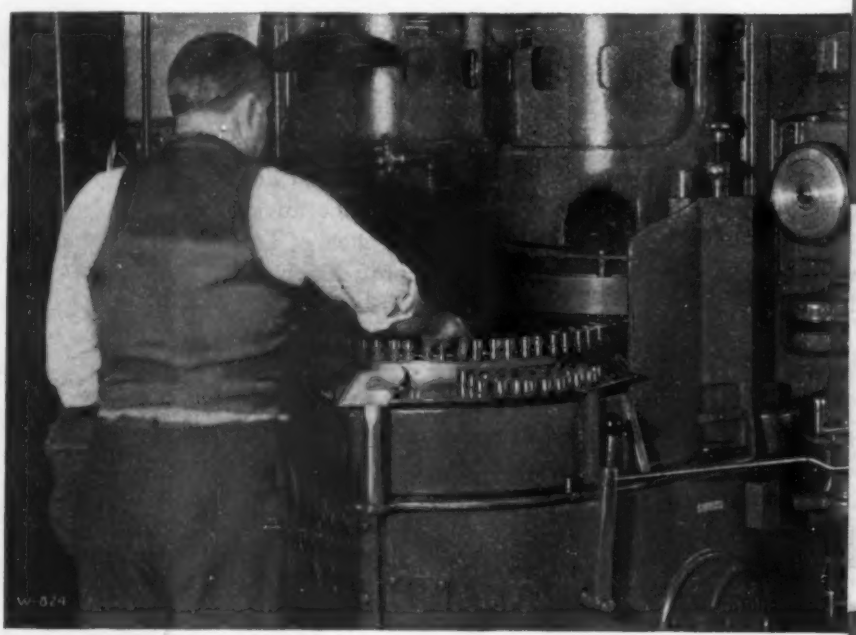
"PUT IT ON THE BLANCHARD"

These heat treated steel trunnion bearings are ground on a No. 16-A2 Blanchard Surface Grinder.

They are loaded on special 80-station fixture with magnetic studs locating from previously ground surface. The end of the bearing is then ground to very close limits. At the unloading station the work is automatically ejected and demagnetized.

.005" to .015" of stock is removed, to limits of ± .0005". 18,500 pieces are produced per 8 hour shift.

Grinding Trunnion Bearings on No. 16-A2 Blanchard Surface Grinder.



CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

- ★ Production
- Adaptability
- Fixture Saving
- Operation Saving
- Material Saving
- ★ Fine Finish
- ★ Flatness
- ★ Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*

BLANCHARD

The BLANCHARD MACHINE COMPANY

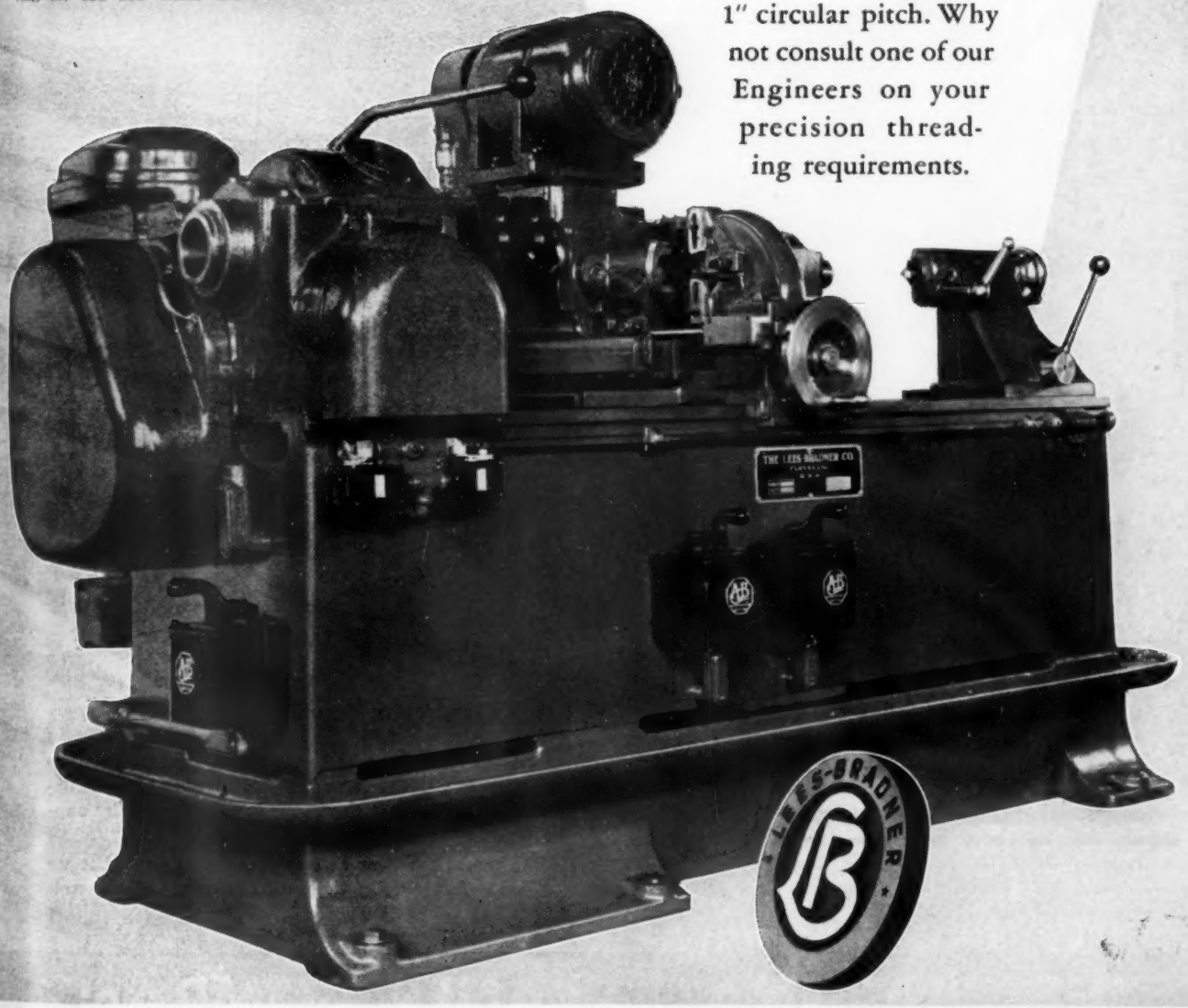
64 STATE STREET, CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

For Continued, Dependable Accuracy

LEES-BRADNER LT THREAD MILLER

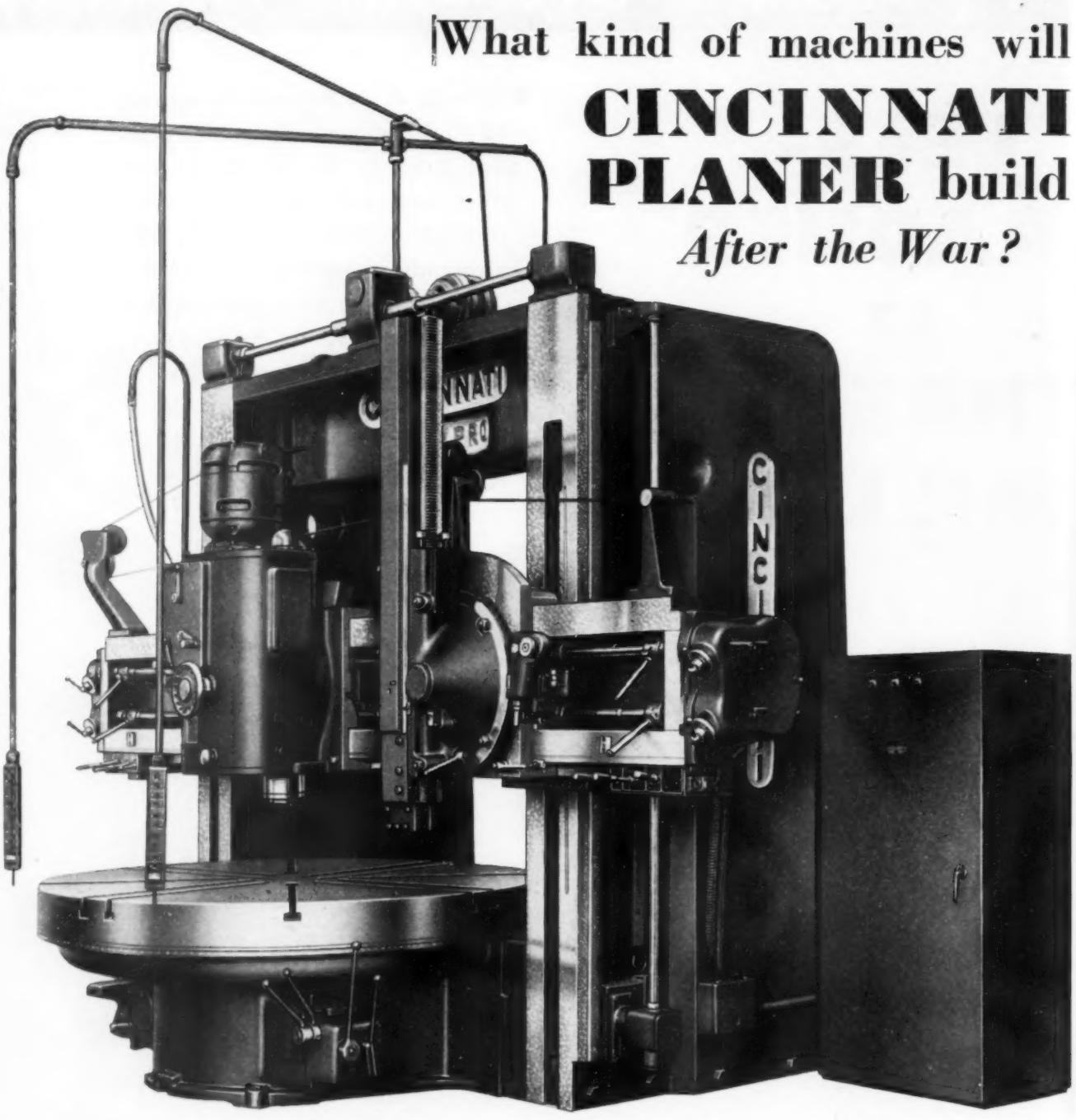
● Because of its dependable accuracy and high productive capacity the Lees-Bradner Model LT Thread Miller has gained wide acceptance throughout industry. Suitable for either internal or external threading, it can be used with equal ease for disc or hob type threading on work to a maximum diameter of six inches. The machine is available in several length capacities with a rated capacity of 1" circular pitch. Why not consult one of our Engineers on your precision threading requirements.



The **LEES-BRADNER** *Company*

CLEVELAND 11, OHIO, U.S.A.

What kind of machines will CINCINNATI PLANER build *After the War?*



• **A fair question . . . deserving of a frank answer!**

While we are now devoting our whole facilities to War Production, we are of course giving a lot of thought to this question. We do have plans for new machines such as the CINCINNATI HYPRO Combination Boring, Turning and Milling Machine shown above. But, we expect to continue the manufacture of the CINCINNATI HYPRO Planers, Vertical Boring Mills and Planer Type Millers with which you are already familiar . . . machines that have already proved their ability to reduce costs for you.

You can be sure that we will continue to build powerful and accurate tools that will earn you a profit in your shop. At the same time we will protect your investment in CINCINNATI HYPRO tools of recent design, which are now operating in your plant, by supplying you with extra equipment as needed.

In the meantime your own suggestions as to what we can build for you, in the post-war era, will be welcome.

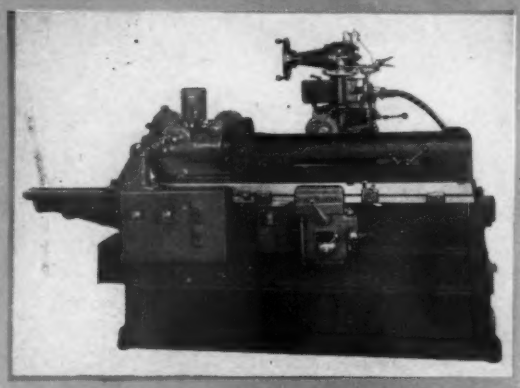
THE CINCINNATI PLANER COMPANY

Planers...Vertical Boring Mills...Planer Type Millers

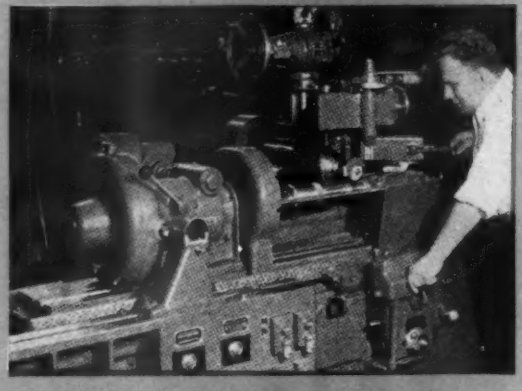
CINCINNATI . OHIO . U.S.A.

Get all 3 - DIMENSIONAL ACCURACY PERFECTION OF FINISH PRODUCTION SPEED

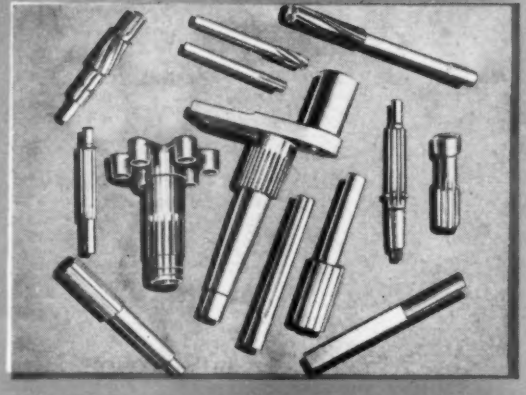
with FITCHBURG *Automatic Closed Cycle Grinding . .*



FITCHBURG SPLINE GRINDER



GRINDING SPLINES ON WRIGHT AIRPLANE CRANKSHAFTS



EXAMPLES OF WORK GROUND ON FITCHBURG SPLINE GRINDER

The Fitchburg formed wheel grinding method, with automatic closed cycle, produces a wide variety of splines for automotive, airplane and marine industry with fine finish, accuracy and high speed. This results in smoother product performance.

Here are some of the outstanding features of the Fitchburg Spline Grinder:—

These machines are designed so that new operators can be trained quickly to operate them — an important factor in these times.

Wheelhead column may be arranged to swivel to a maximum of 20 degrees for either right-hand or left-hand helical lead angle when helical attachments are furnished.

Elevating mechanism is mounted on top of the column for the convenience of the operator.

The headstock may be furnished for either straight, right-hand, or left-hand helical splines.

The index plate is mounted at the left-hand end of the headstock so that it may be removed easily for changing plates. There is a standard 16 key plate which will take care of 2, 3, 4, 6, 8 and 12 spline shafts by inserts in the index notches. Separate index plates are necessary for other spline divisions.

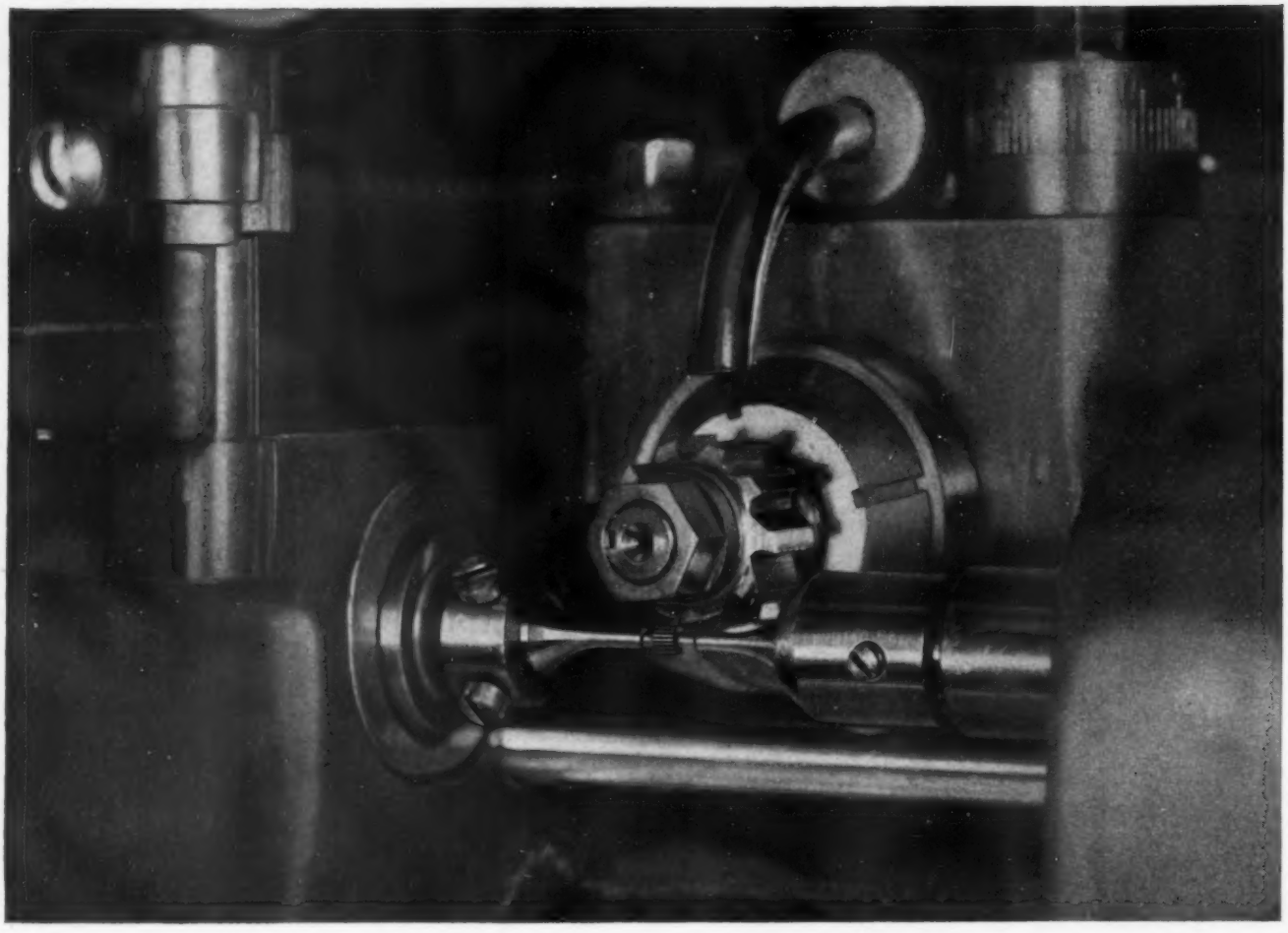
Many leading industrial plants in the United States are using Fitchburg grinding equipment to speed production and save man hours. Let Fitchburg engineers show you how to speed production by this modern grinding method.

Write today for this catalog showing wide range of successful operations.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.



THIS TINY GEAR HELD WITHIN .0003" ON P. D. WITH BARBER-COLMAN TYPE "S" HOBBING MACHINE

CONSIDER a gear only .111″ in outside diameter and with a face width of .086″, having 18 teeth of 180 diametral pitch — how would *you* go about cutting those teeth? Then consider that the accuracy requirements called for *not over .0003″ error* on the pitch diameter when measured over wires .1133″ — how would *you* consistently maintain that precision? Finally, consider that the specifications called for "very fine finish"— how would *you* obtain it? . . . This customer found the answer in a Barber-Colman Type "S" Hobbing Machine. A tenth indicator was added to the machine to gauge the extreme accuracy needed for positioning. The Type "S" Machine is designed for hobbing spur gears and pinions less than 1″ diameter and ½″ face. For production jobs, the Type "S" is fitted with a magazine feed, which, with the complete cam-controlled cycle, makes it a *fully automatic* machine requiring only the loading of the magazine. For complete details call your nearest Barber-Colman representative.

WRITE FOR CIRCULAR

The remarkable achievements in manufacture of small gear-cutting tools are summarized in our Circular F-1976 "Fine-Pitch Hobs." Write for a copy and learn what can *now* be done to put small gears on a precision-production basis.

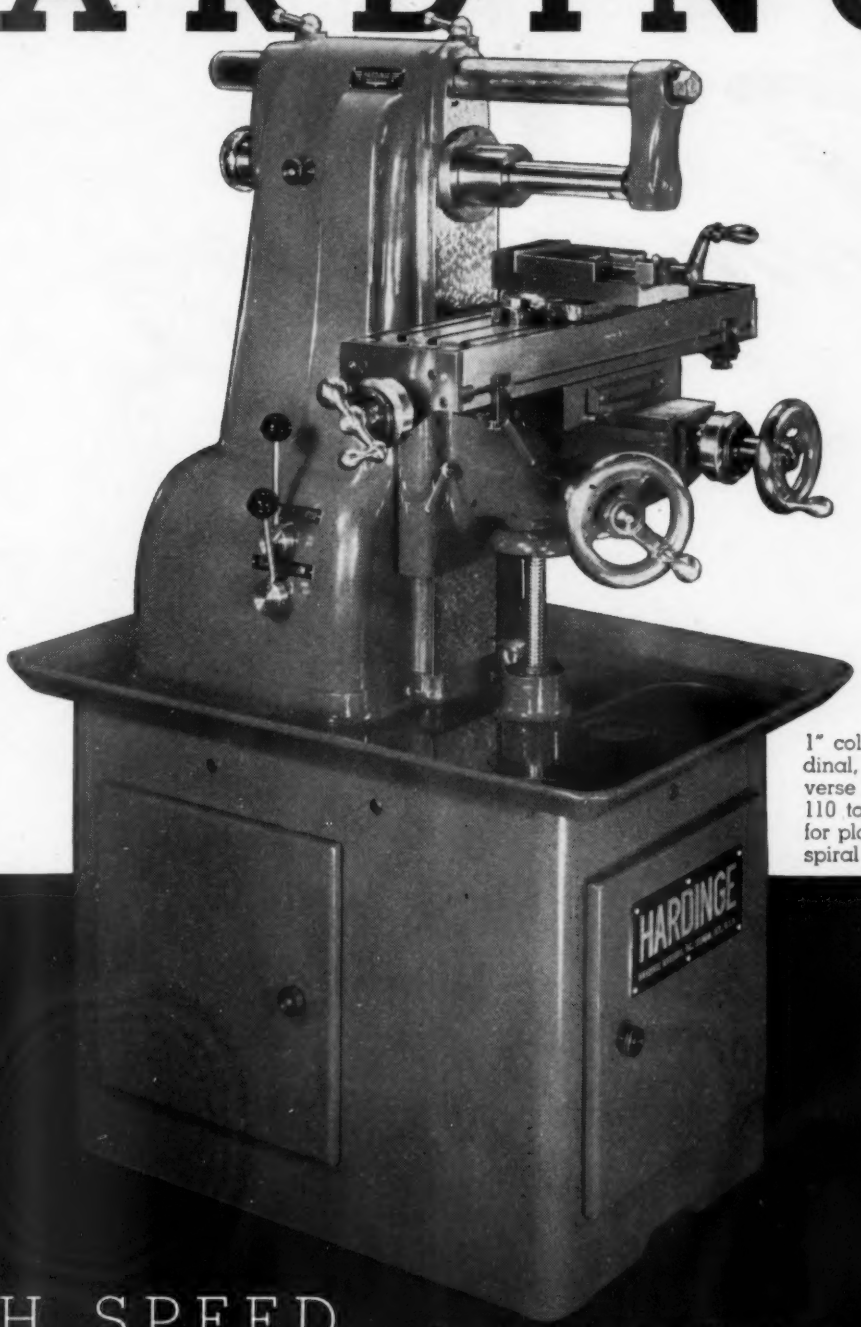
Buy War Bonds

BARBER B-C COLMAN PRODUCTS: HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 201 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

HARDINGE



SPECIFICATIONS

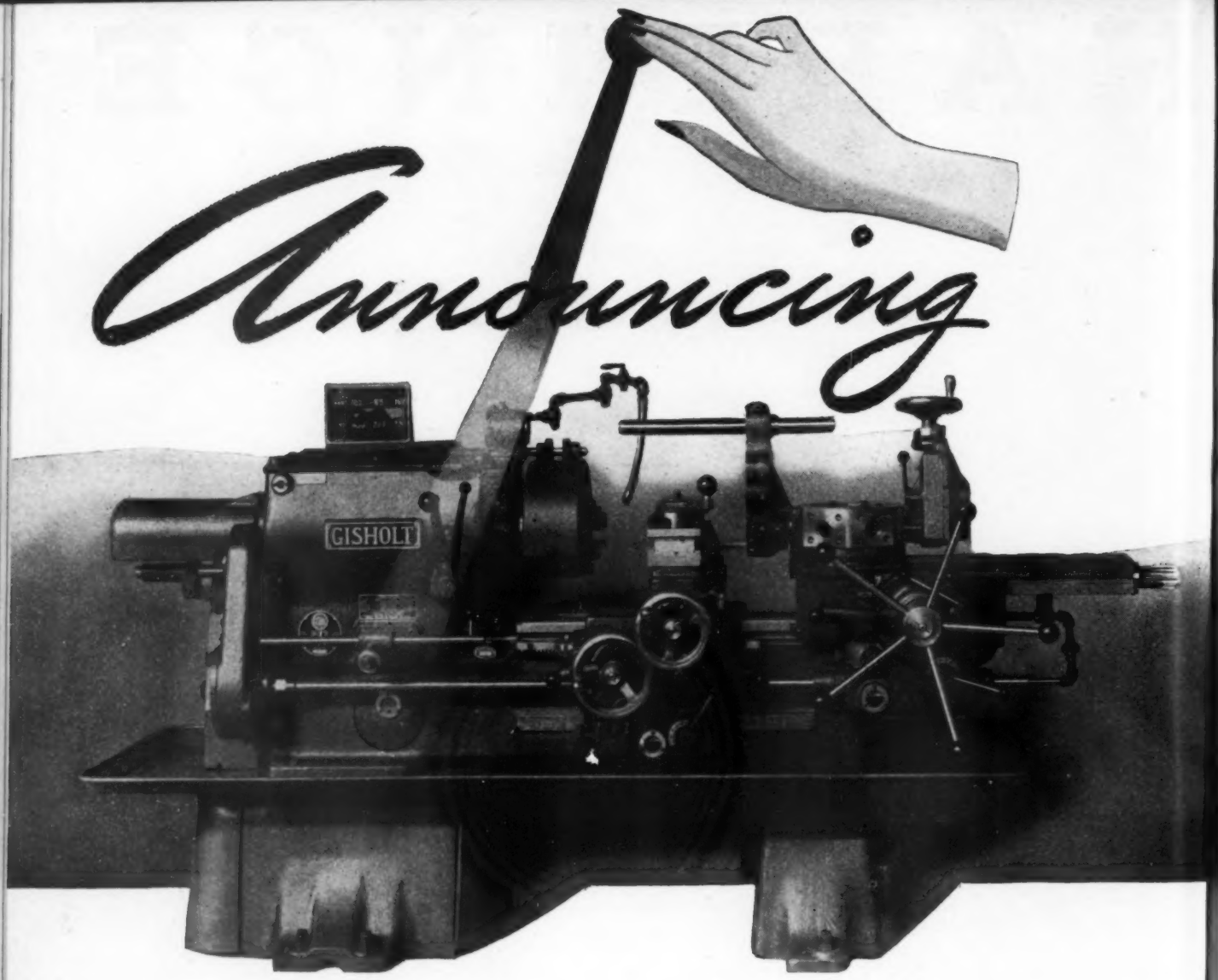
1" collet capacity, 14" longitudinal, 13¼" vertical, 5½" transverse travel, eight speeds from 110 to 1850 R.P.M. TM model for plain milling, UM model for spiral milling.

HIGH SPEED PRECISION MILLING MACHINE

Precision tool room milling is profitable on this milling machine, designed to meet a definite need in the tool room and laboratory. The precision construction, along modern lines, combines ruggedness with extreme accuracy for ease of operation. Investment and time cost will indicate that larger milling machines are extremely expensive and awkward for many tool room and laboratory milling operations.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.



SMOOTHER, SWIFTER, EFFORTLESS OPERATION

with hydraulic clutching and braking

Now, as an aid to war production, Gisholt announces hydraulic control for starting, stopping and reversing the spindle. It takes only a flick of the control lever—right or left—to engage the forward or reverse clutches. In neutral, or stop position, automatic hydraulic braking of the spindle brings work quickly and smoothly to rest.

This finger-tip control saves time, of course. It speeds up production, especially where rapid work calls for frequent starting and stopping of the machine. It saves effort; for muscle power is supplanted by hydraulic power. It enables women to "man" the turret lathes without physical exertion. And clutches may be adjusted to pull the heaviest cuts that the tools and work will stand.

For over two years this hydraulic control has been proved and perfected under actual shop conditions. It is now supplied as standard equipment on all Gisholt Ram Type Turret Lathes.

GISHOLT MACHINE COMPANY
1201 East Washington Avenue • Madison, Wisconsin

LOOK AHEAD • KEEP AHEAD • WITH GISHOLT *IMPROVEMENTS IN METAL TURNING*

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

The bird that is its own mother!

THE FABLED PHOENIX lives for 500 years. At the end of that time, it builds itself a nest in the branches of an oak or the top of a palm tree. After the funeral pyre is complete with cinnamon, spikenard and myrrh, the phoenix sets the nest on fire and burns itself alive.

From its body, or its ashes, a young phoenix issues forth, destined to live another 500 years. When it is strong enough, it carries the nest—its own cradle and its parent's coffin—to the temple of the Sun.

We think the modern parallel to this story is even more interesting, **because it's true!** Did you know that machine tools are the mothers of machines? They are the only things made by man that can reproduce themselves. And it's fortunate for us they can, because machine tools are a measure of the degree of civilization of a country.

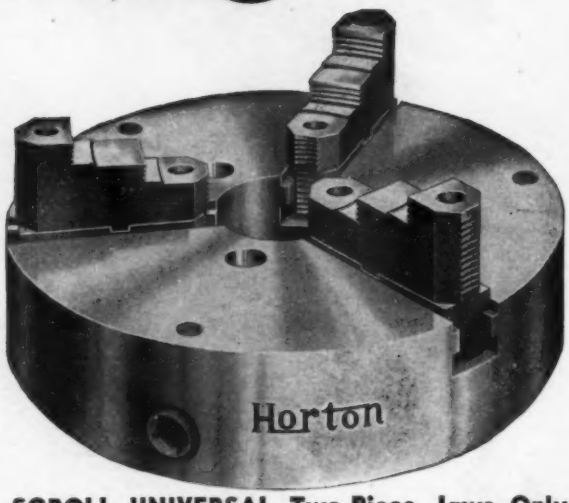
Machine tools are the foundation of all modern industrial production. They are not only essential for the manufacture of every class of engine and kind of mechanism, but every manufactured product—metal goods, textiles, foodstuffs, scientific instruments, building materials—all must be built on machine tools or on a machine constructed with their help!

In the post-war era, Cone Multiple Spindle Automatic Lathes will be even more essential than they are now. Their unique advantages of departmentalized control will be available to industry to help bring us all better living than we have ever known before.

CONE Automatic Machine Company, Inc., Windsor, Vermont

Horton chucks

INDEPENDENT Solid Reversible Jaws Only

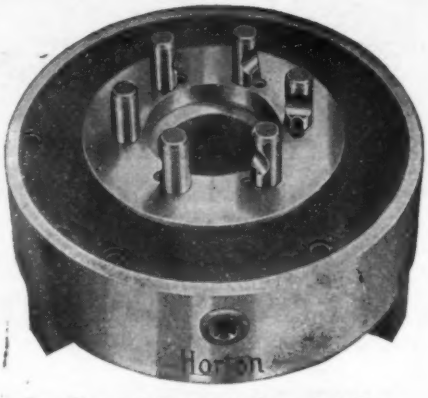


SCROLL UNIVERSAL Two-Piece Jaws Only

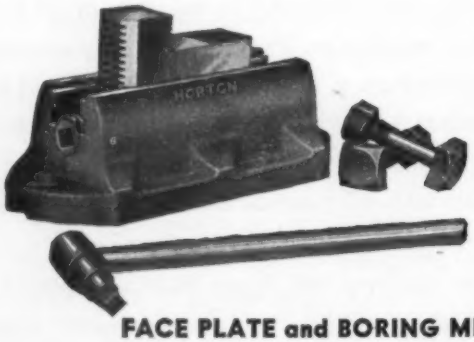
For Use With Intermediate Plates On Threaded Spindles

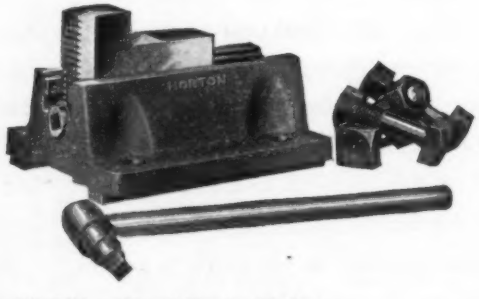
For Key Drive Tapered Nose Spindles

War Production Limited To These Essential Chucks



For Flanged Tapered Nose Spindles
Illustration shows Chuck for Type D (Cam Lock) Spindle





FACE PLATE and BORING MILL JAWS—Steel Body Only

HORTON
MORROW

SINCE 1851 .... THE E. HORTON & SON CO.

WINDSOR LOCKS, CONNECTICUT, U. S. A.

Lifting the fog FROM THE INDUSTRIAL BATTLEFIELD

Coolant mist from high-speed machine tools takes its toll of men and machines just as surely as a well-placed bomb. By coating light fixtures it reduces valuable footcandles needed for accurate production. By collecting on the ceiling and dripping, it causes operator discomfort, destruction of electrical insulation, and slippery floors that constitute a safety hazard.

Attempts at removal of this mist by mechanical filters are only ten to fifteen per cent effective. Moreover, badly needed and expensive winter heating capacity and summer air cooling capacity are required to replace shop air exhausted.

The practical solution to the problem is a Westinghouse-developed electronic device, the PRECIPITRON*. Oil-mist removal is over ninety per cent effective; room-temperature air is available for re-use. In addition to improvement in operator efficiency, morale, and safety, there is a resultant reduction in electrical failures and in heating and air cooling expense . . . and the reclaimed oil is made available for re-use.

THE MACHINE IN MACHINE TOOLS

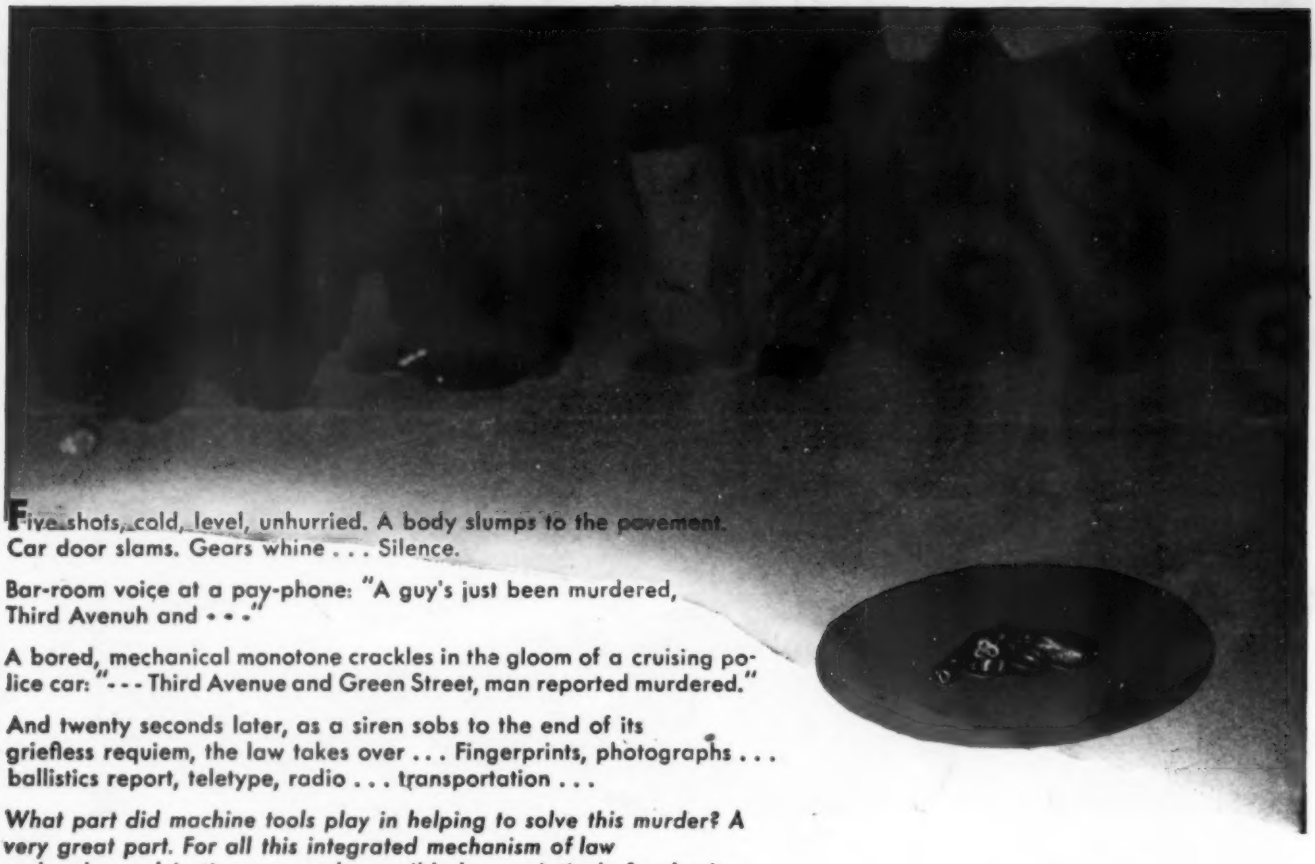
Truly, Westinghouse may be said to have put the "machine" in machine tools. George Westinghouse was pioneering the application of alternating current for power at the same time that the empirical designs of early tool builders were first being adapted to machine drives. The growth of the two industries was so interdependent that it would be difficult to trace the history of either one separately. Through the years, that interdependence has come to mean collaboration, in a measure typified by the relationship of Westinghouse engineers with the representatives of the nation's leading machine tool builders. Their ability to provide simple electrical solutions to complex mechanical problems is yours for the asking. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania.

*Trade-mark Registered in U.S.A.

J-94574

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE



Five shots, cold, level, unhurried. A body slumps to the pavement. Car door slams. Gears whine . . . Silence.

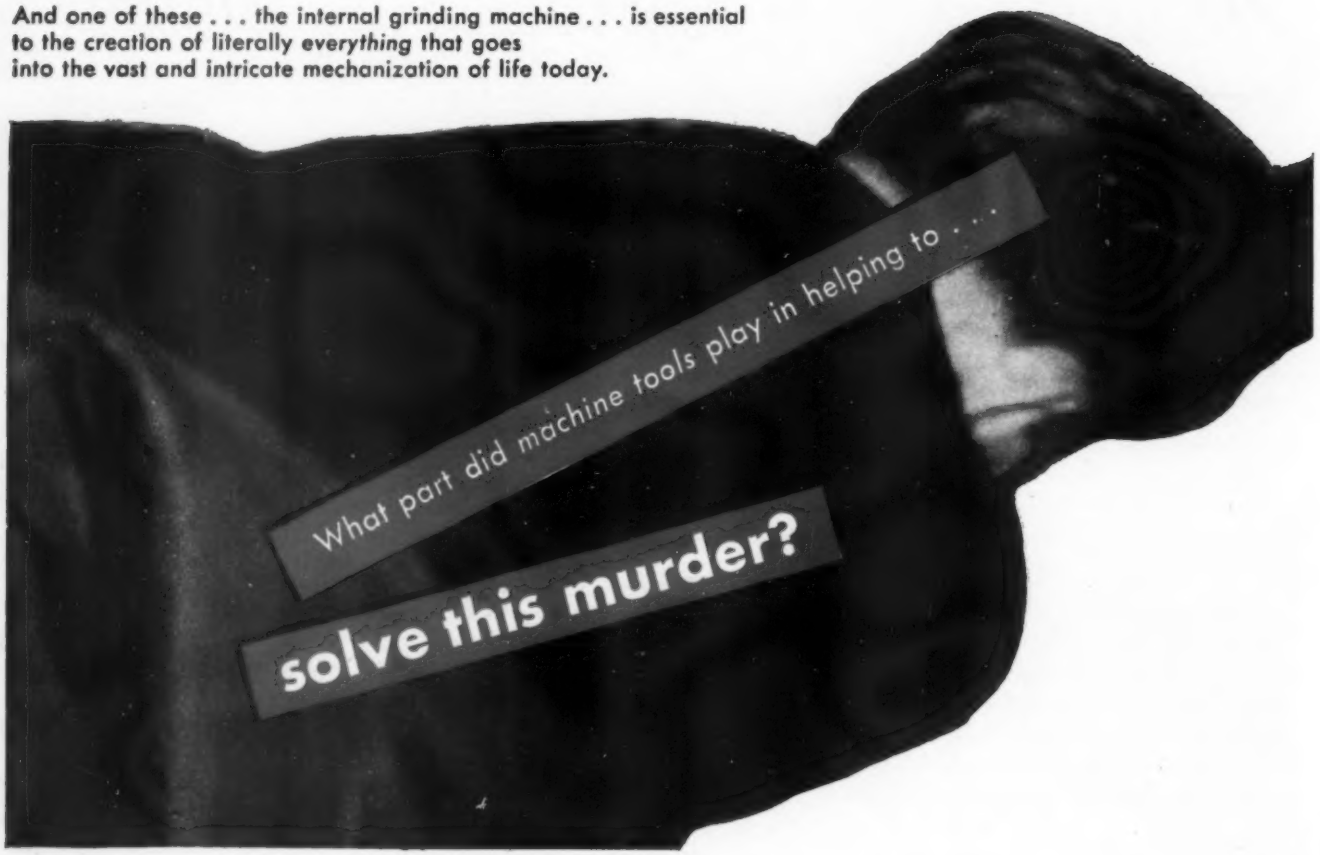
Bar-room voice at a pay-phone: "A guy's just been murdered, Third Avenuh and • • •"

A bored, mechanical monotone crackles in the gloom of a cruising police car: "• • • Third Avenue and Green Street, man reported murdered."

And twenty seconds later, as a siren sobs to the end of its griefless requiem, the law takes over . . . Fingerprints, photographs . . . ballistics report, teletype, radio . . . transportation . . .

What part did machine tools play in helping to solve this murder? A very great part. For all this integrated mechanism of law and order and justice was made possible by a relatively few basic precision machine tools.

And one of these . . . the internal grinding machine . . . is essential to the creation of literally *everything* that goes into the vast and intricate mechanization of life today.



BRYANT

BRYANT CHUCKING GRINDER CO. SPRINGFIELD VERMONT, U.S.A.

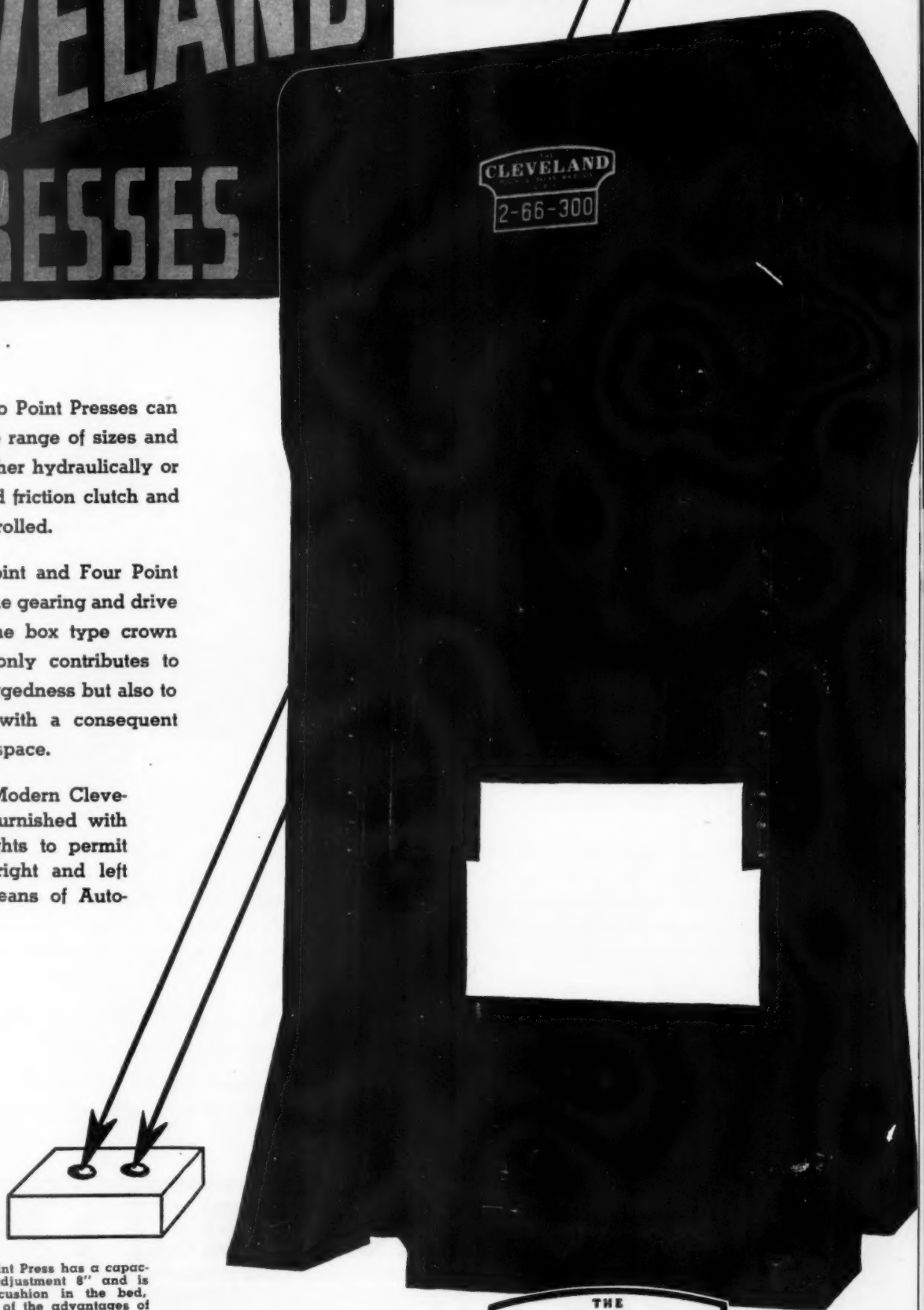
MODERN CLEVELAND PRESSES

two Point

Modern Cleveland Two Point Presses can be furnished in a wide range of sizes and capacities and with either hydraulically or pneumatically operated friction clutch and brake, electrically controlled.

As with the Single Point and Four Point Presses of this series, the gearing and drive units are located in the box type crown and this design not only contributes to greater rigidity and ruggedness but also to general compactness with a consequent saving in overall floor space.

When desired, these Modern Cleveland Presses can be furnished with openings in the uprights to permit feeding the material right and left across the dies by means of Automatic Feeds.



This Cleveland 2-66-300 Two Point Press has a capacity of 300 tons, stroke 16", adjustment 8" and is equipped with a pneumatic cushion in the bed, thereby giving the Press most of the advantages of a Double Action Press.

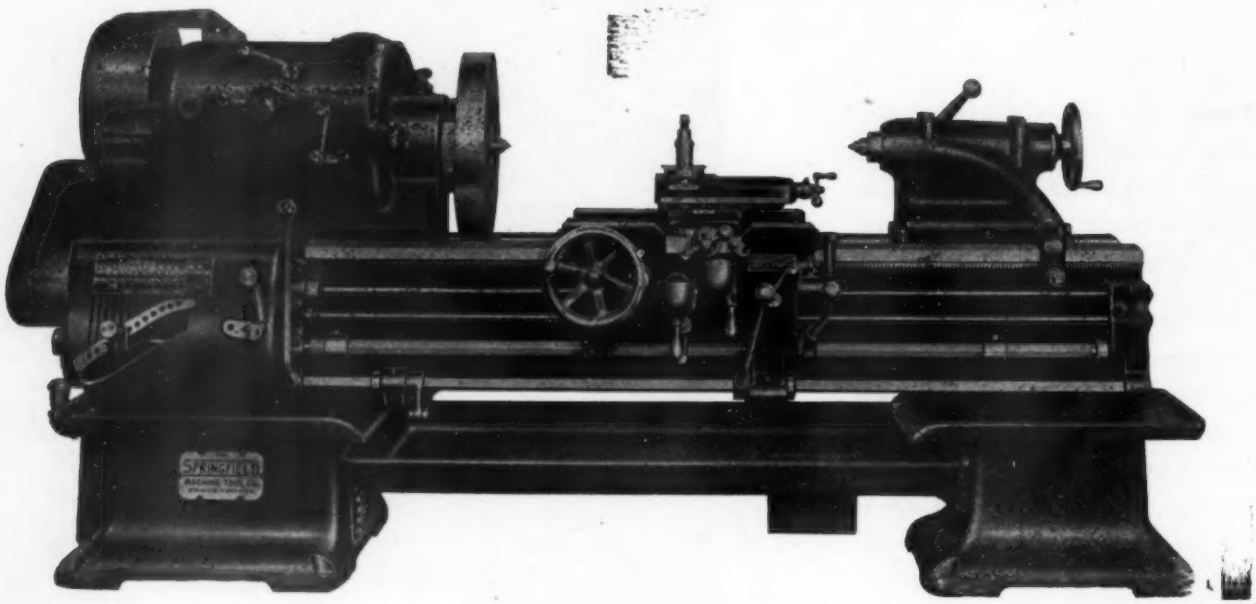
THE CLEVELAND PUNCH & SHEAR WK'S CO. U. S. A.

THE CLEVELAND PUNCH & SHEAR WORKS CO CLEVELAND, OHIO

FOR CONTINUED ACCURACY OVER A GREAT NUMBER OF YEARS

SPRINGFIELD

PRECISION LATHES



● Extreme accuracy and long life obtained from Springfield lathes is due to the deep, well ribbed bed made from High Test Chrome Gray Iron. Made in our own Foundry, we have found from exhaustive metallurgical and wear tests by professional laboratories and actual operation in the field that this material gives greater wear resistance, freedom from scoring and freedom from internal strains. As a result you get greater accuracy throughout the life of the lathe.

Designed right—built right—and made of scientifically correct materials—Springfield lathes are giving continued accuracy over a greater number of years.

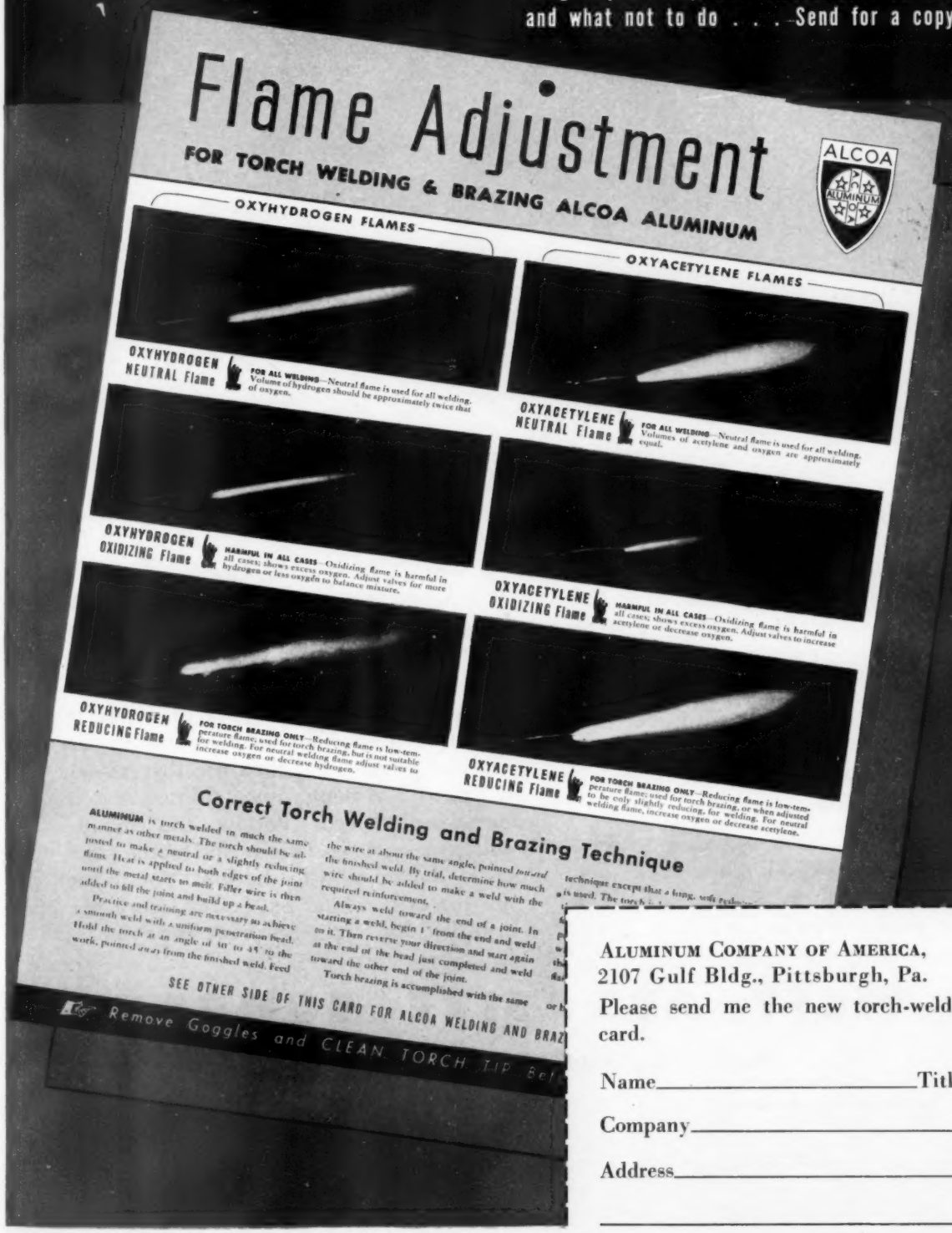
Thinking in terms of heavy production demanded in war times and for the peace time output to follow, you can't go wrong with a Springfield Lathe. Sizes range from 14" to 30".

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

This card tells your Welders how-

Printed in full color on a heavy card, 11"x14", to hang in your shop, with instructions on what to do and what not to do . . . Send for a copy today.


Flame Adjustment
FOR TORCH WELDING & BRAZING ALCOA ALUMINUM
ALCOA
ALUMINUM
OXYHYDROGEN FLAMES
OXYACETYLENE FLAMES
OXYHYDROGEN NEUTRAL Flame
FOR ALL WELDING—Neutral flame is used for all welding. Volume of hydrogen should be approximately twice that of oxygen.
OXYACETYLENE NEUTRAL Flame
FOR ALL WELDING—Neutral flame is used for all welding. Volumes of acetylene and oxygen are approximately equal.
OXYHYDROGEN OXIDIZING Flame
HARMFUL IN ALL CASES—Oxidizing flame is harmful in all cases; shows excess oxygen. Adjust valves for more hydrogen or less oxygen to balance mixture.
OXYACETYLENE OXIDIZING Flame
HARMFUL IN ALL CASES—Oxidizing flame is harmful in all cases; shows excess oxygen. Adjust valves to increase acetylene or decrease oxygen.
OXYHYDROGEN REDUCING Flame
FOR TORCH BRAZING ONLY—Reducing flame is low-temperature flame; used for torch brazing, but is not suitable for welding. For neutral welding flame adjust valves to increase oxygen or decrease hydrogen.
OXYACETYLENE REDUCING Flame
FOR TORCH BRAZING ONLY—Reducing flame is low-temperature flame; used for torch brazing, or when adjusted to be only slightly reducing, for welding. For neutral welding flame, increase oxygen or decrease acetylene.
Correct Torch Welding and Brazing Technique
ALUMINUM is torch welded in much the same manner as other metals. The torch should be adjusted to make a neutral or a slightly reducing flame. Heat is applied to both edges of the joint until the metal starts to melt. Filler wire is then added to fill the joint and build up a bead.
Practice and training are necessary to achieve a smooth weld with a uniform penetration bead. Hold the torch at an angle of 30° to 45° to the work, pointed away from the finished weld. Feed the wire at about the same angle, pointed toward the finished weld. By trial, determine how much wire should be added to make a weld with the required reinforcement.
Always weld toward the end of a joint. In starting a weld, begin 1" from the end and weld to it. Then reverse your direction and start again at the end of the bead just completed and weld toward the other end of the joint.
Torch brazing is accomplished with the same technique except that a
is used. The
SEE OTHER SIDE OF THIS CARD FOR ALCOA WELDING AND BRAZ
Remove Goggles and CLEAN TORCH TIP Bef

ALUMINUM COMPANY OF AMERICA,
2107 Gulf Bldg., Pittsburgh, Pa.

Please send me the new torch-welding instruction card.

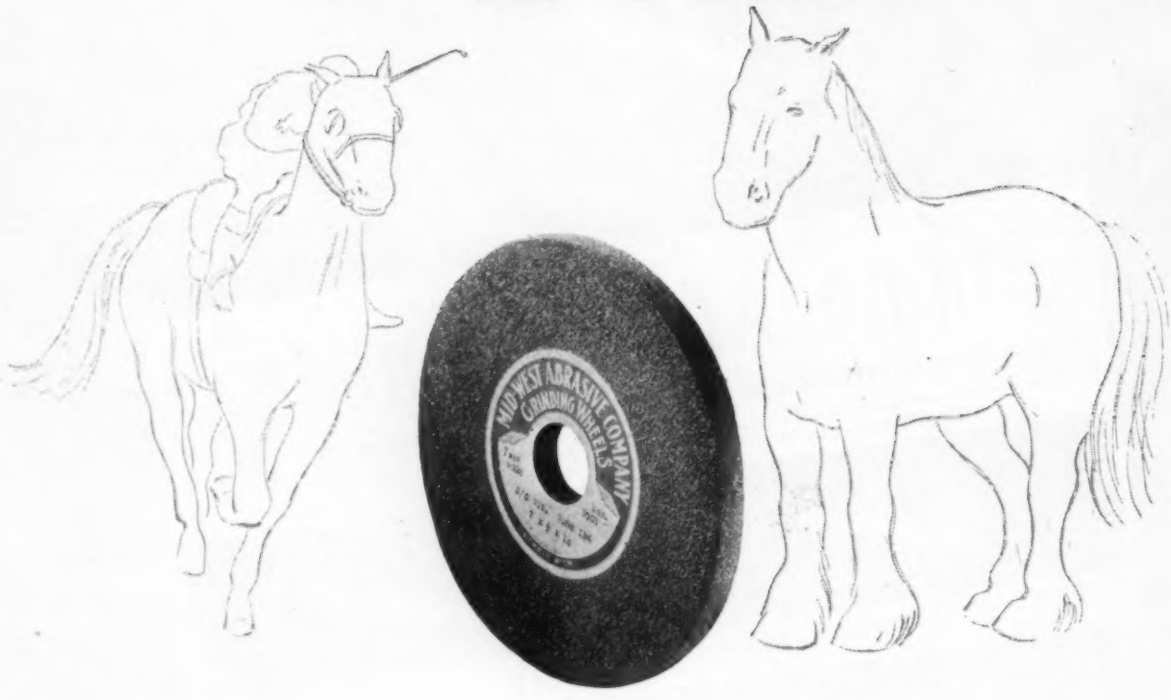
Name_____ Title_____

Company_____

Address_____

GRINDING WHEELS AND HORSES

have this in common



Grinding wheels, like horses, are selected with a view toward what they are expected to do. You wouldn't buy a race horse to pull a plow — or pit a plow horse against a Man o' War.

The most important factor in proper surface grinding is selecting the RIGHT type of wheel to do the *particular* type of grinding you expect it to do.

MID-WEST "B" BOND grinding wheels, like all other MID-WEST wheel types, are engineered to perform specific grinding jobs—and they can be depended on to do those jobs quickly and efficiently. The "B" BOND wheel pictured here, for instance, is a MID-WEST silicon carbide vitrified 3.60 straight wheel, sized 7 x ½ x 1¼. It is built specifically to grind carbide tipped tools.

Aside from the proper *shape* of wheel, it is extremely important to select the proper grain and grade—and then use that wheel intelligently. Among other things, watch your wheel speed. Follow the manufacturer's recommendation. And watch your feed — don't "crowd" the job! You'll get more pieces per hour as well as more per wheel. Let our engineers prove it to you.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

1960 E. Milwaukee Avenue **Detroit 11, Mich.**

BETTER AND FASTER WAYS TO PRODUCE PARTS
ARE BEING APPLIED TO STEP UP PRODUCTION ON

P&J AUTOMATIC CHUCKING EQUIPMENT

Never content with merely "good enough", P & J engineers are constantly applying their long, successful experience in search of practical ways and means to "better the best" in speed, quantity and quality of production.

That is why Potter & Johnston Chucking equipment has been so universally outstanding in the Arsenals of Democracy in turning out duplicate parts of all kinds for war materiel. Time per piece has been vastly reduced — pieces per machine have been greatly stepped up — more and better production has been achieved well within the limits of available manpower.

These results have been possible of achievement by taking advantage of the unusual tooling facilities offered in P & J equipment as well as the power, capacity and precision performance of these sturdy, convenient, easily handled machines.

The POTTER & JOHNSTON
MACHINE COMPANY
Pawtucket, R. I.

AMERICAN
ROLL WARD
THE AMERICAN TOOL WORKS CO.
CINCINNATI, U.S.A.
AMERICAN
FOR
ALL-OUT
PRODUCTION
LATHES
RADIALS
SHAPERS

Manpower Shortage

CAN BE MET

and PRODUCTION MAINTAINED

with

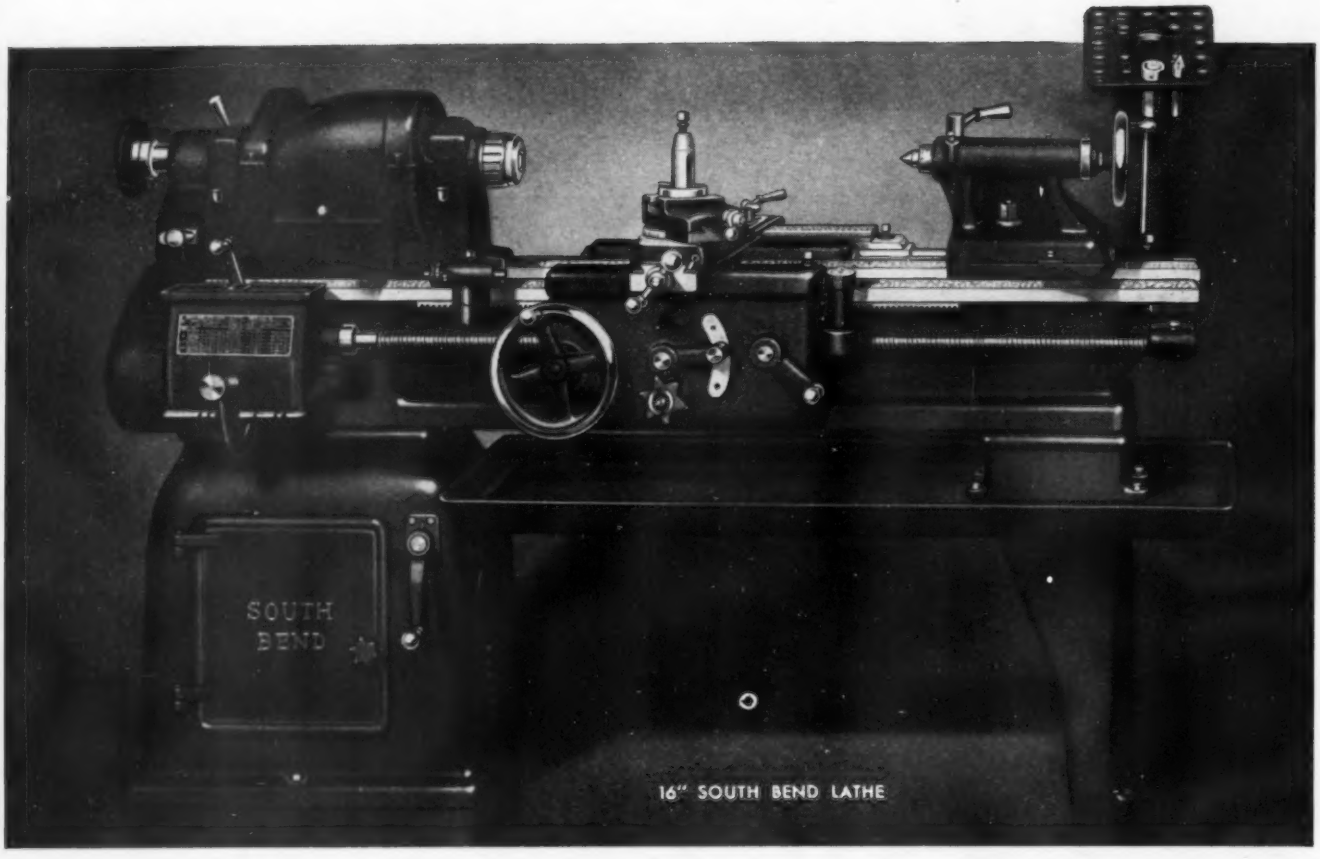
"AMERICAN" *Hole Wizard* RADIALS

Give an operator a modern machine tool such as the "AMERICAN" Hole Wizard and in many cases he can duplicate the output of two equally efficient men handling the same job on two old, out-moded machines. Furthermore, control convenience features of the modern machine enable the operator to maintain his production schedule with a minimum of manual effort.

Achievement of all-out production need not be handicapped by shortage of manpower when "AMERICAN" RADIALS, with their greater speed, capacity, accuracy and convenience are installed to replace obsolete machines.

The **AMERICAN TOOL WORKS CO.**

Cincinnati, Ohio



16" SOUTH BEND LATHE

SOUTH BEND LATHES

FOR UNIFORM ACCURACY

SPECIFICATIONS of 16" lathe

Swing over bed	16¼"
Distance between centers	33½"
Maximum collet capacity	1"
Hole through spindle	1⅜"
Thread cutting feeds (48)	4 to 224 per inch
Spindle speeds (8)	21 to 725 r. p. m.
Power longitudinal and cross feeds	48

BUY WAR BONDS

WAR PRODUCTION demands uniform accuracy. The loss of time or the waste of scarce strategic materials because of variations in machining cannot be tolerated. There is no place in our war production plan for equipment that cannot be relied upon to maintain the required tolerances.

Sound design and careful workmanship give South Bend Lathes the dependable precision that assures uniform accuracy at all times and speeds-up production on the most exacting machining operations.

South Bend Engine Lathes and Toolroom Lathes are made with 9", 10", 13", 14½", and 16" swings, with bed lengths from 3' to 12'. The Turret Lathes are made with 9" and 10" swings. Write for Catalog No. 100-C in which they are all described and illustrated.

TRAINING HELPS — Sound films, books, wall charts, and bulletins are available for training lathe operators. Write for Bulletin No. 21-C.

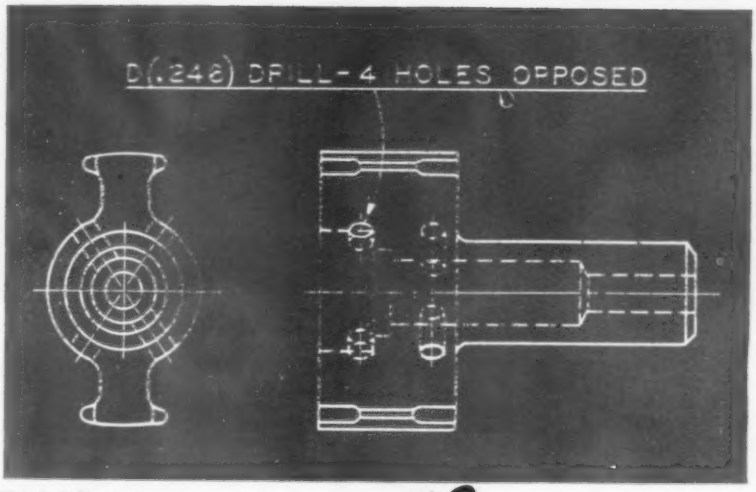
SOUTH BEND LATHE WORKS

LATHE BUILDERS FOR 36 YEARS • SOUTH BEND 22, IND.

There are 2 *ways to do this job —*

1. The EXPENSIVE WAY . . . or

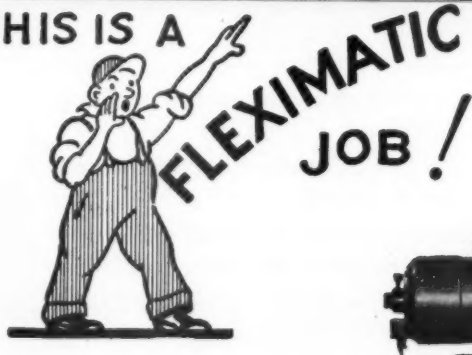
2. The FLEXIMATIC *by KINGSBURY*



WAY

The expensive way to drill the four opposed holes in this shock absorber part would be to use a general-purpose drilling machine. Production would be limited to one hole at a time and by operator skill in manual indexing, etc. The FLEXIMATIC way uses standard Units set up on a standard base around an automatically indexing turret. The only manual operations are loading and unloading, and even as these are being performed the Units are drilling work already loaded.

FLEXIMATICS combine the speed and efficiency of a special purpose machine with the valuable advantages obtained by the flexible set-up.



Standard Kingsbury Units for drilling, reaming, boring, spot facing and many milling operations may be mounted in any combination on standard bases and readily changed over to manufacture a wide variety of parts.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.

There is a
BAY STATE WHEEL
for *every* CUT-OFF JOB

1. Constant, rigid laboratory check on all raw materials.
2. Manufactured in air-conditioned department to control characteristics of bonding agents.
3. Rough sides — a development for cleaner, cooler, faster cutting.
4. Special heat resistant compositions to prevent excessive bond disintegration.

These are but a few reasons why BAY STATE wheels excel. Write for bulletin containing specific recommendations.

BAY STATE
ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

PRECISION FILES

. . . precision-made for precision use

▲ Boeing craftsman using Nicholson precision file on small instrument part for a "Flying Fortress."

Nicholson X.F. Swiss Pattern Files in use on die finishing. ▶

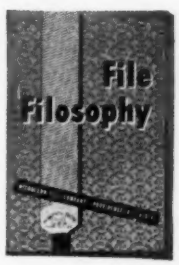
MAKING quality precision files is as much a matter of skill as using them. It calls for workmanship of the highest order; for specific-analysis steels held uniform under rigid inspection; for manufacturing technique that demands undivided devotion to the art of file making. . . . A task for specialists, indeed!

Nicholson has been specializing on files—and files only!—for *seventy-nine years*. Nicholson builds its own file-cutting machines. They embody Nicholson inventions which are among the greatest improvements in modern file-making processes.

If at times you experience difficulty in getting certain types or sizes of Nicholson X.F. Swiss Pattern Files, blame it on the tremendous wartime demand for these types of files; and to the unusual problems of greatly increasing production (for it takes years for file cutters to attain the superior skill required for this exacting work).

FREE BOOK, "FILE FILOSOPHY"

The foremost book of its kind! Interesting, informative, authoritative . . . 48 profusely illustrated pages on regular, saw, precision and other special purpose files; on proper use and care of files; history, terminology, etc. Invaluable to shop foremen, key mechanics, production and purchasing heads. *Send for a copy*.



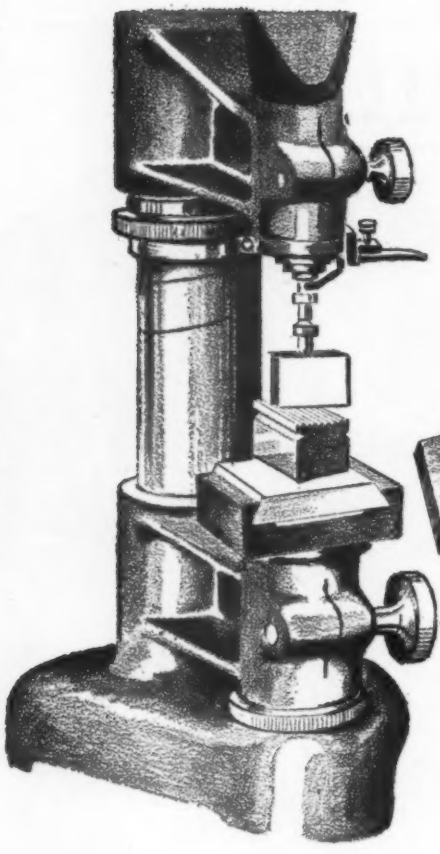
NICHOLSON FILE COMPANY • 29 ACORN STREET, PROVIDENCE 1, R. I., U. S. A.

(Also Canadian Plant, Port Hope, Ont.)

NICHOLSON FILES

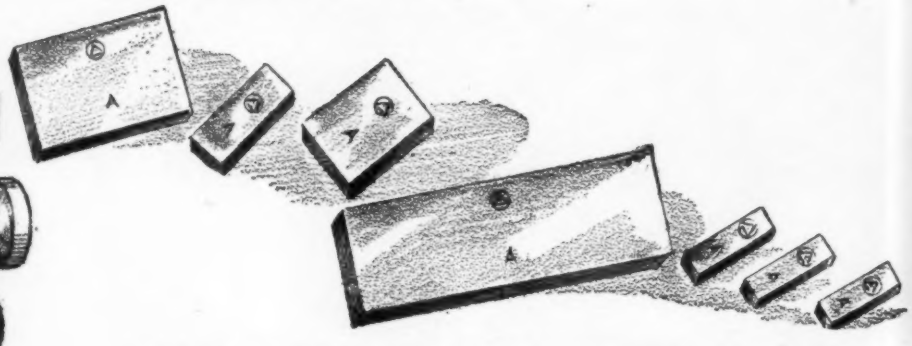
FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U. S. A.



Precision

IS BECOMING INCREASINGLY MORE IMPORTANT . . . WITH YESTERDAY'S MAXIMUM STANDARDS BECOMING TOMORROW'S MINIMUM



NOW IS THE TIME TO TRANSFER GAGE BLOCK ACCURACY TO YOUR WORK . . . with the COMPARITOL

Almost every shop, large or small, engaged in precision work, uses gage blocks. However, some practical, effective means is required to transfer gage block accuracy to the product itself in such a manner that individual measuring skill or feel can be practically eliminated.

The SCHERR COMPARITOL provides a tried and proved means of transferring such precision without variations caused by the human factor. Thus the COMPARITOL can be depended on to assure close tolerance inspections and by so doing offers the following attendant advantages:

. . . reduces finished part inspection to a fast, fool-proof visual operation

. . . promotes interchangeability and trouble-free assembly

. . . makes it easy to give all shop tools and gages regular inspections for accuracy and wear

. . . speeds production and lowers costs by saving inspection time.

Order a SCHERR COMPARITOL on 10 days' approval. Give it a trial on *your* work and see for yourself what it will accomplish in your production.

Facts ABOUT THE SCHERR COMPARITOL

No Electric Elements — operates 100% mechanically with consistent high accuracy. Only two moving parts.

Easy to Use — can be used at any convenient point; simple to operate; easy to set.

Low Measuring Pressure — an important advantage in checking delicate parts.

Extra Lift of Feeler Point — providing safety to instrument on over-size work.

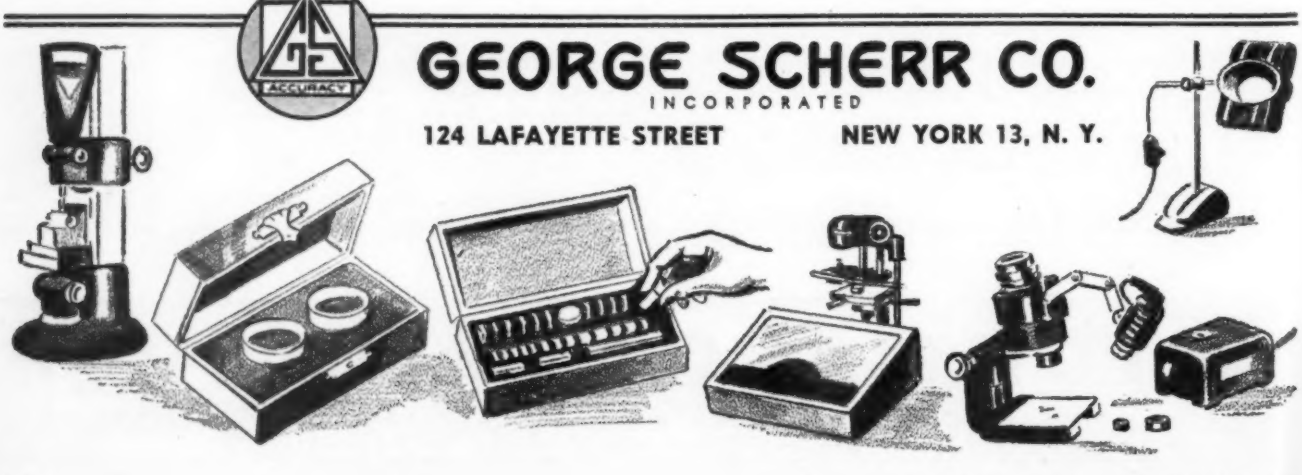
PRICES

Standard 0-6" Range	$195.00
Heavy Duty 0-8" Range	$250.00

GEORGE SCHERR CO.

INCORPORATED

124 LAFAYETTE STREET NEW YORK 13, N. Y.



UNION

For Wartime Tool Economy

Present conditions make it vitally important that maximum service be obtained from every small tool. One of the first steps toward tool economy is to choose tools that are known for their ruggedness and longer lasting accuracy.

Choose UNION Tools — treat them well — and you will see the results of your economy in the longer accurate service and uninterrupted production you get from every tool bearing the UNION name.

UNION TWIST DRILL CO.
ATHOL, MASS.

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec.

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 6540 Antoine St.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

Divisions of the UNION TWIST DRILL CO.

UNION BUTTERFIELD CARD

THE **Right** REAMER FOR EVERY WARTIME JOB

Butterfield

Today's problem is to combine maximum efficiency and unquestioned accuracy in the production of parts for ships, guns, tanks, shells and planes. In plants where war production records are being set, Butterfield Reamers are turning out work that meets rigid standards of precision and, at the same time, demonstrating their ability to give long, economical service. The completeness and the uniformity of the Butterfield line make it possible to choose the "one best" tool for every job from this single convenient source of supply.

Divisions of the
UNION TWIST DRILL CO.

BUTTERFIELD DIVISION

DERBY LINE, VT. **ROCK ISLAND, QUE.**

***STORES:** New York, 61 Reade St. Chicago, 11 So. Clinton St. Cleveland, Hal. W. Reynolds, 3346 Superior Ave. Detroit, 6540 Antoine St. Los Angeles, 524 E. Fourth St. Toronto, 137 Wellington St., West. Montreal, 111 St. Paul St., West. Winnipeg, 403 Travellers Bldg. Vancouver, 327 Shelly Bldg. Agents for Great Britain—Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S. E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.*

UNION BUTTERFIELD CARD

A PRECISION PRODUCT . . . A LIFETIME OF PRACTICAL EXPERIENCE

For over 65 years, we have been making Card Taps for precision applications in every industry. Today, more than ever before, higher standards of accuracy, tougher, harder materials and increased production schedules call for superior tools. For your war production needs, choose your taps from the complete line made by the Card organization of tap experts . . . and get the added value of our lifetime of knowledge of every angle of tap use.

The CARD Quality

S. W. CARD MFG. CO.

MANSFIELD, MASS.

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 6540 Antoine St.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

Divisions of the
UNION TWIST DRILL CO.

UNION BUTTERFIELD CARD

CARBIDE TIPPED

LOVEJOY MILLING CUTTER BLADES

for

HEAVIER CUTS
COARSER FEEDS
HIGHER SPEEDS

The trend is to carbides! But this modern cutting alloy presents certain problems. Will the machine stand the higher speeds and heavier feeds? And how about the cutter? Modern machine tools are built to take this extra strain—and so are modern Lovejoy Milling Cutters. Nowhere else can you find the rigidity in interchangeable milling cutters found in Lovejoy Cutters. Solid forged steel housings, plus *positive-locking* blades make a rugged combination that puts Lovejoy Cutters in a class with solid cutters. That's what makes Lovejoy Cutters ideal for carbide tipped blades—that's why they stand up and produce under heavier cuts, coarser feeds and higher speeds—that's why it will pay you to write for Catalog No. 26 which shows the complete Lovejoy line.

LOVEJOY
TOOL COMPANY, Inc.
SPRINGFIELD, VERMONT, U.S.A.

There was a time when mathematical knowledge remained the guarded privilege of a few. Counsel based on this knowledge, impressively interwoven in priestly pagan ritual, was only given after heavy tribute had been paid.

For example, the priests of ancient Egypt accumulated vast riches by being able to forecast the flood periods of the Nile. Since farming was the major occupation of the people, information about the rise and fall of the river was essential to the nation's economy. Hidden from the people was the fact that the supernatural predictions of the priests were founded on purely mortal calculations, the result of keeping the calendar and maintaining daily records of the depth of the Nile.

Today, essential knowledge is no longer submerged in ritual. In fact, the knowledge now available to all men, instead of the priestly few, has become so vast, that specialization in all fields is a necessity.

Clearing's specialty is the design and construction of mechanical and hydraulic presses. Clearing presses of unusual and tremendous capacities have been developed, often for applications that represent distinct advancements in production techniques. For production problems that can or might be solved by presses, you can assuredly come to Clearing for worthwhile assistance.

CLEARING MACHINE CORPORATION
6499 West 65th Street, Chicago, Illinois

CLEARING

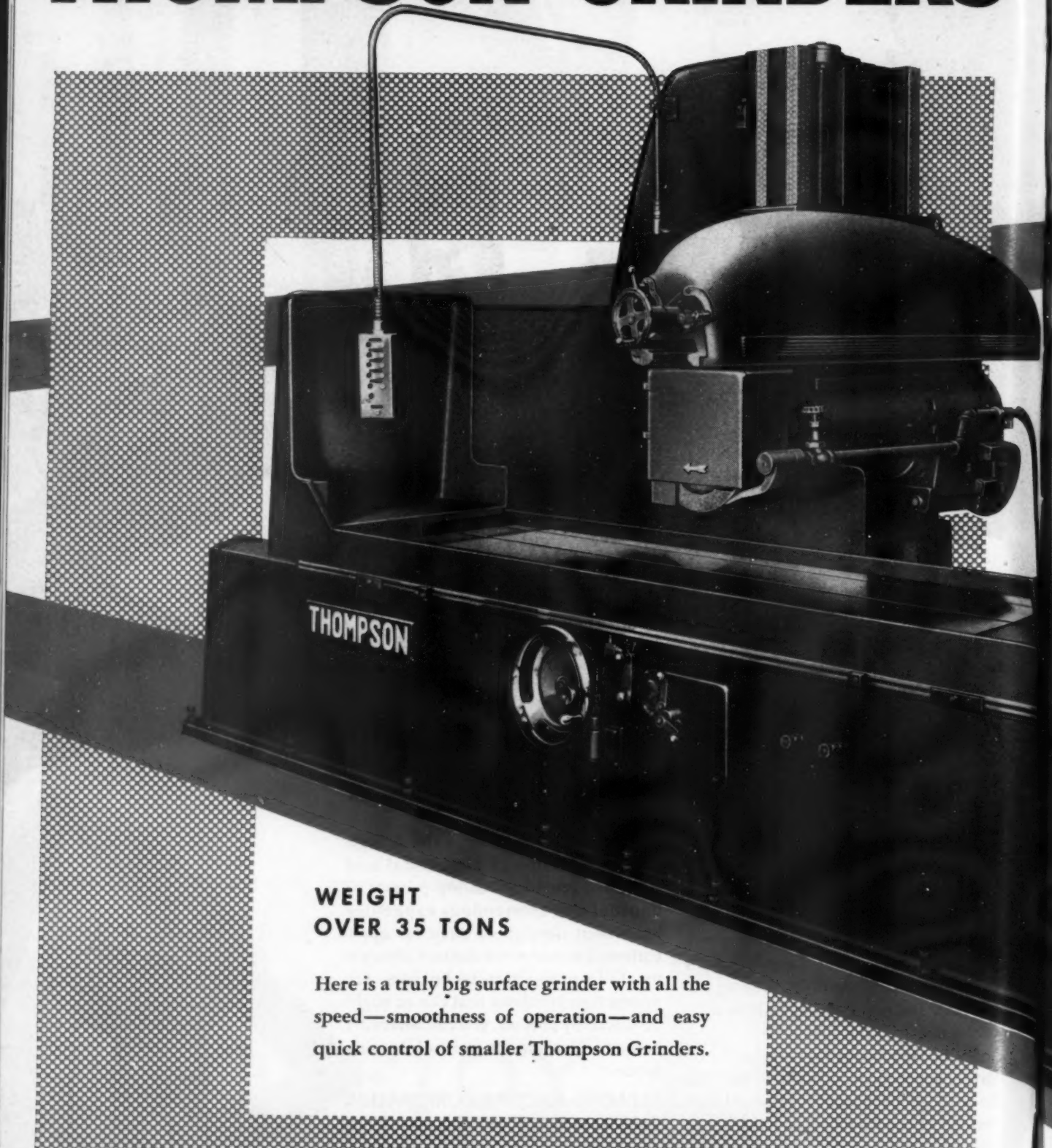
CLEARING PRESSES

MECHANICAL AND HYDRAULIC

CMC CLEARING

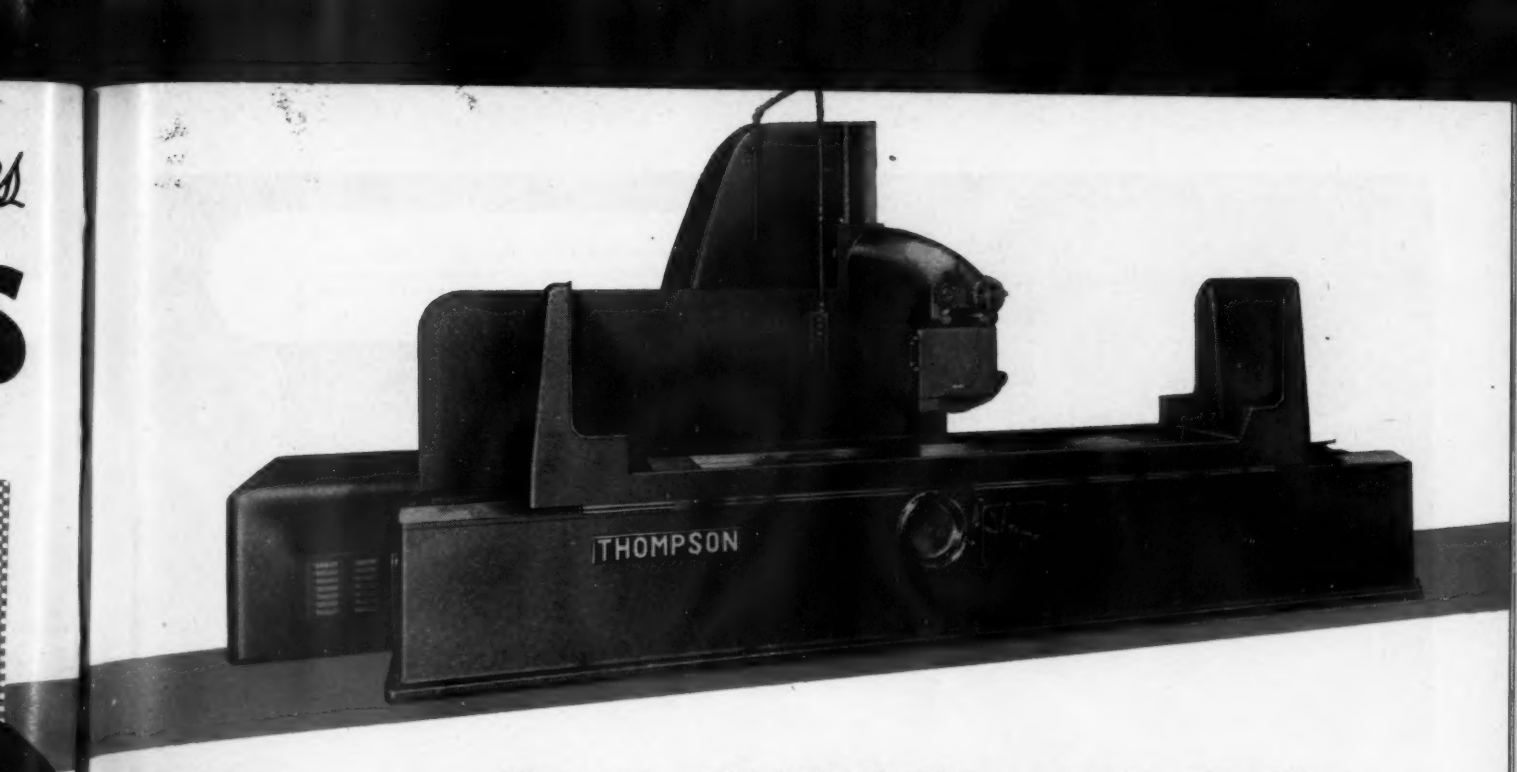
For precision grinding of large flat surfaces

THOMPSON GRINDERS



WEIGHT
OVER 35 TONS

Here is a truly big surface grinder with all the speed—smoothness of operation—and easy quick control of smaller Thompson Grinders.



Illustrated is a Model TG-1001 Thompson Grinder—36″ x 36″ x 120″—weighing over 35 Tons—(70,500 pounds, to be exact). This model is built in standard height of 36″, in two widths 30″ and 36″, and in various lengths from 72″ to 240″.

It features—30 HP Wheel head, pressure lubricated spindle, hydraulic wheel truing speeds, Anti friction power elevation, Dial type wheel head control, Table speeds from 10 to 100 feet per minute, Pressure lubrication to table ways, Rectangular ways, Remote control attachment for operating power elevation down feed etc., and Finger tip control.

The TG-1001 Thompson Grinder offers the utmost in grinder capacity—high production—and exceptional accuracy and smooth finish to particularly large work. It is regularly equipped with a 20″ x 6″ x 12″ wheel.

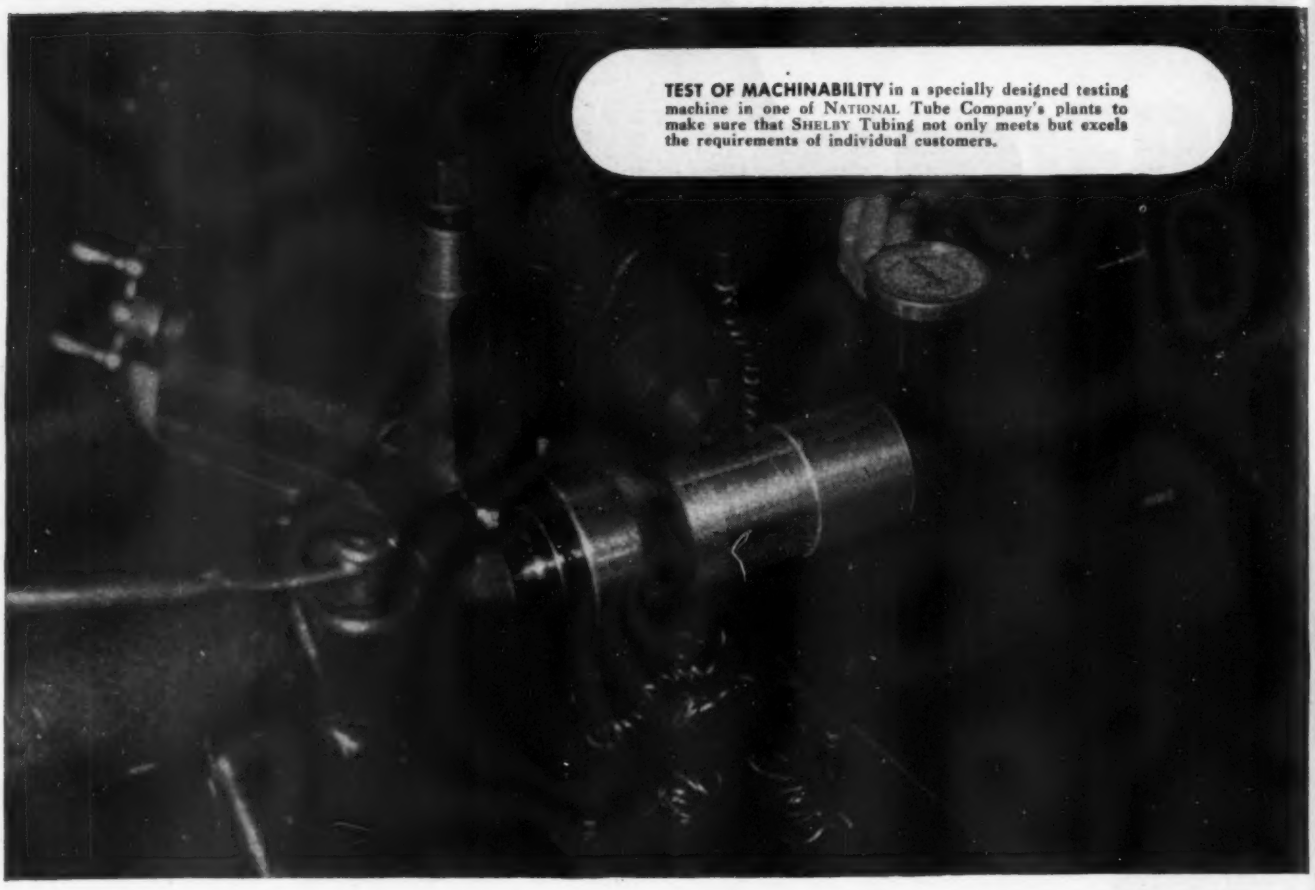
For full particulars and detailed description of the various unit assemblies—write for our new broadside covering this modern capable Hydraulic Grinder. Ask for bulletin covering the TG-1001 Grinder.

THE

Thompson

GRINDER CO.

SPRINGFIELD, OHIO



TEST OF MACHINABILITY in a specially designed testing machine in one of NATIONAL Tube Company's plants to make sure that SHELBY Tubing not only meets but excels the requirements of individual customers.

This kind of *Machinability* means speed . . . with economy!

MANY large users claim that the machinability of SHELBY Seamless Mechanical Tubing has lifted their production of precision parts out of the loss into the profit column.

The various jobs handled by mechanical tubing require a number of different grades of metal, ranging from simple low carbon to high alloy steels. So the wide range of grades produced by NATIONAL Tube Company helps manufacturers to meet wartime demands for peak production.

We furnish to users, every month, miles of steel tubing of various analyses, each one best fitted to do its intended job. Also, by special processing, we can supply SHELBY Steel Tubing for any customer's individual needs.

To maintain absolute assurance that machinability will be uniformly high, our service engineers, backed by our own operating and metallurgical departments, work right with the customer to develop the material *best suited to his individual machining requirements.*

It will pay you well, in savings of time and money, to keep fully informed on the latest developments of mechanical tubing for precision parts. Let us help you solve your machining problems. Write today.

★ *BACK THE ATTACK WITH WAR BONDS* ★

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

UNITED STATES STEEL

SEE THAT VIBRATION?

Of course, you'd never see it! No human eye could detect a microscopic movement of only .000025". But the stroboglow lamp and the electronic tube can *see* and *feel* these vibrations.

With Dynetric Balancing Machines, the faintest impulse caused by unbalanced forces is caught at each revolution, enabling the operator to *locate* and *measure* the unbalance and then make accurate correction for it.

Today, Dynetric Balancing is used on all sizes of rotating parts from 1 ounce to 50 tons to help America build better fighting equipment.

DYNETRIC BALANCING MACHINES speed up work in this department where hundreds of armatures of various sizes are balanced every day. Numerals which revolve with the work piece clearly locate the point of unbalance. Literature is yours for the asking.

GISHOLT MACHINE COMPANY

1201 EAST WASHINGTON AVE., MADISON, WISCONSIN

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements

TURRET LATHES • AUTOMATIC LATHES

GISHOLT

BALANCING MACHINES

OHIO DREADNAUGHT SHAPERS

OHIO'S STEP UP PRODUCTION

Orders for Ohio Dreadnaught Shapers are now being shipped with reasonable promptness.

This 36" Ohio Super-Dreadnaught Shaper is suited particularly to troublesome, large, odd-sized jobs. Table, 30" x 48". Ram bearing in column, 56"x15". Length of ram without head, 80". Long ram allows 36" of stroke at any position on table or if job projects beyond front of table. Maximum distance from drop table (when furnished) to ram, 30". Weight of standard machine, 13400 lbs. Complete range of standard accessories available, especially attachments for railroad work.

ASK FOR OUR BULLETIN NO. 59

☆

• Ohio Dreadnaught Shapers answer the insistent demand for top production with their ample power, heavy duty design and construction, and reserve capacity. These features enable them to machine bigger and still bigger parts and more and more of them. One-position control makes the machine "easy on the man." In-built rigidity promotes fast, accurate work. Convenience and flexibility heighten production. Many accessories and attachments are available to meet your individual requirements.

Orders for Ohio Dreadnaught Shapers are now being filled with reasonable promptness. Better indicate your needs at once.

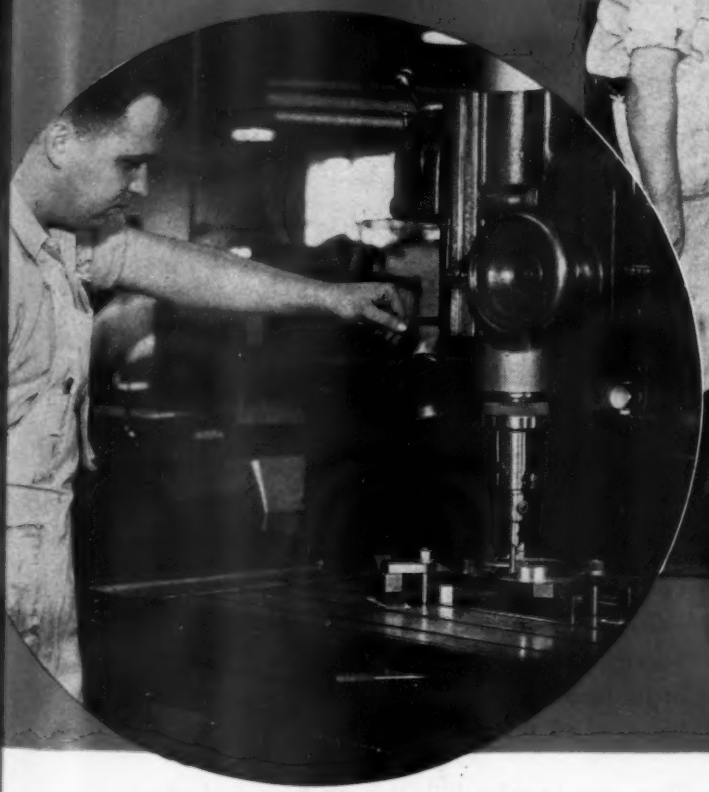
THE OHIO MACHINE TOOL COMPANY • • KENTON, OHIO

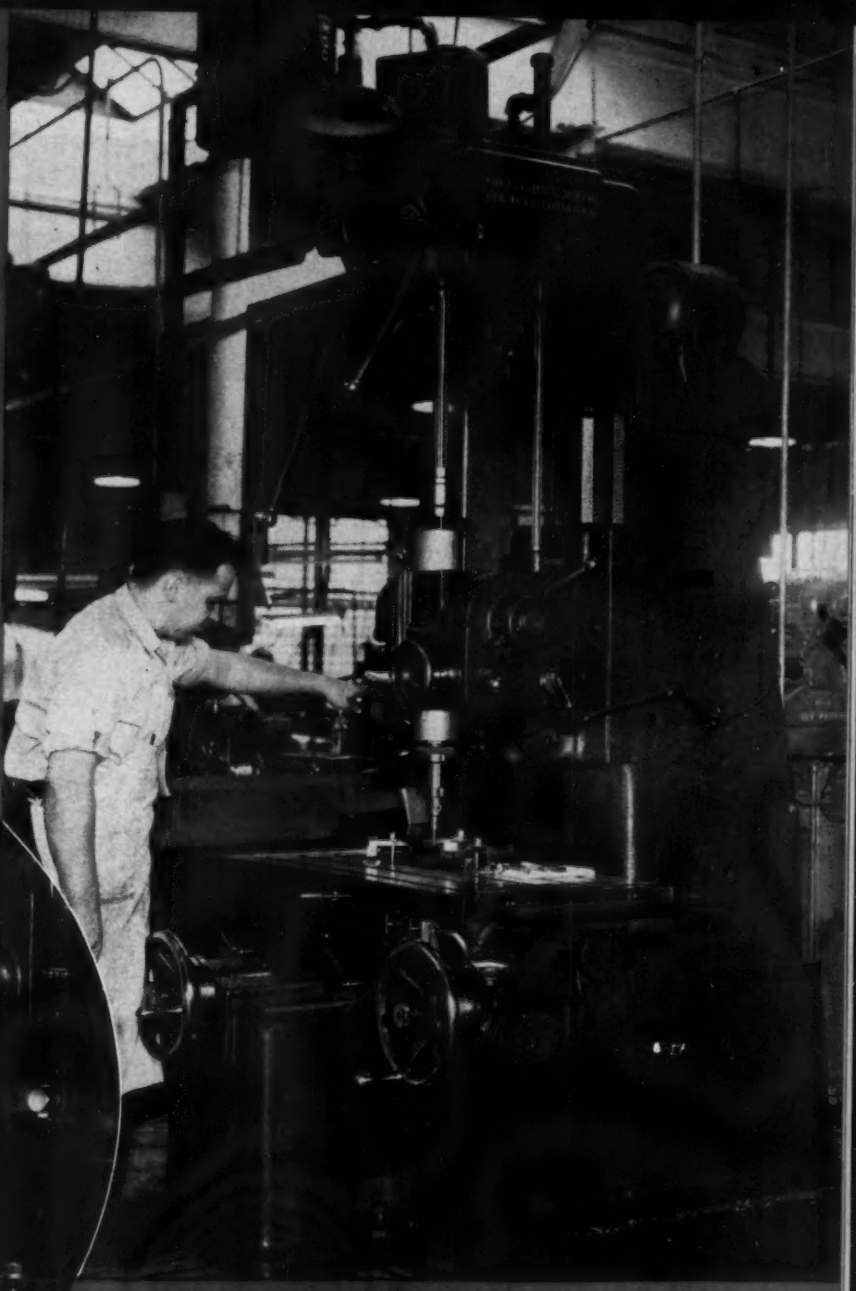
OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

FOSDICK *Jig Borers*

ON PRECISION GAUGE WORK





ARMY E NAVY

● Accuracy in gauge work begins with the machines making the various parts. The rigidity — versatility — and ease of operation of the Fosdick Jig Borer makes it ideal for close tolerance tool room and gauge work.

Typical of the precision readily obtained is the fixture gauge being drilled on this Fosdick Jig Borer, 6 holes are located at various positions to tolerances of .0002 inch. Holes are .4062 inch diameter.

This is only one of many jobs being handled satisfactorily on this Fosdick Jig Borer at the Waltham Gage Company.

One of the reasons for Fosdick precision is the spindle construction. For example to insure a smooth, accurate hole the drive to the spindle is through a live rubber, shock-proof coupling — the spindle being a separate part from the splined drive shaft.

For dependable precision and high production from a moderate investment make your next jig borer a FOSDICK.

Fosdick Jig Borer Bulletin J.B.A. available on request. Write for yours.

FOSDICK MACHINE TOOL COMPANY

CINCINNATI, OHIO

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button

The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer—Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

DE VLIEG MACHINE COMPANY
450 FAIR AVE. FERNDALE (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS

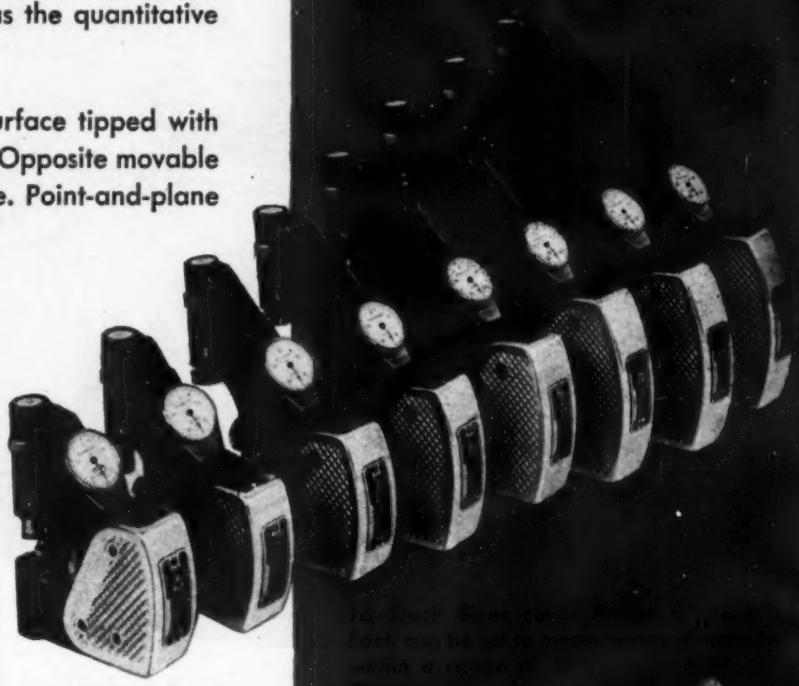
STANDARD

ACCURATE as a Bench Comparator but FAST and PORTABLE!

HERE'S A GAGE that combines PORTABILITY with speed in use and absolute accuracy on dimensions as fine as .0001". STANDARD Dial Snap Gage is portable and easy to handle as a conventional snap gage, yet has the quantitative accuracy of a stationary instrument.

Adjustable gaging pin has a serrated flat surface tipped with tungsten carbide that practically *defies wear*. Opposite movable pin has mushroom top, also tungsten carbide. Point-and-plane construction assures continued, accurate readings whether instrument is set by cylindrical or flat standards.

STANDARD Dial Snap Gages speed inspection, guard against rejects and material spoilage and eliminate human variations not only on precision work but also where tolerances are comparatively liberal. Write for Special Bulletin.



FEATURES

1. High precision indicator approximately 1" in diameter graduated .0001". Bezel rotates for convenient setting.

2. Measuring anvil tipped with tungsten carbide. Indicator protected against shock by sudden applications to measuring pin.

3. Tungsten carbide tipped adjustable anvil has flat lapped serrated surface. Minute chips and dust readily clear from it, helping insure accuracy.

4. Adjustable, spring-cushioned safety stop reduces jar, helps hold work in correct gaging position.

5. Air space between grip and body of instrument protects against hand heat, further safeguards accuracy.

STANDARD GAGE CO., INC., Poughkeepsie, N.Y.

Inspection Arms!

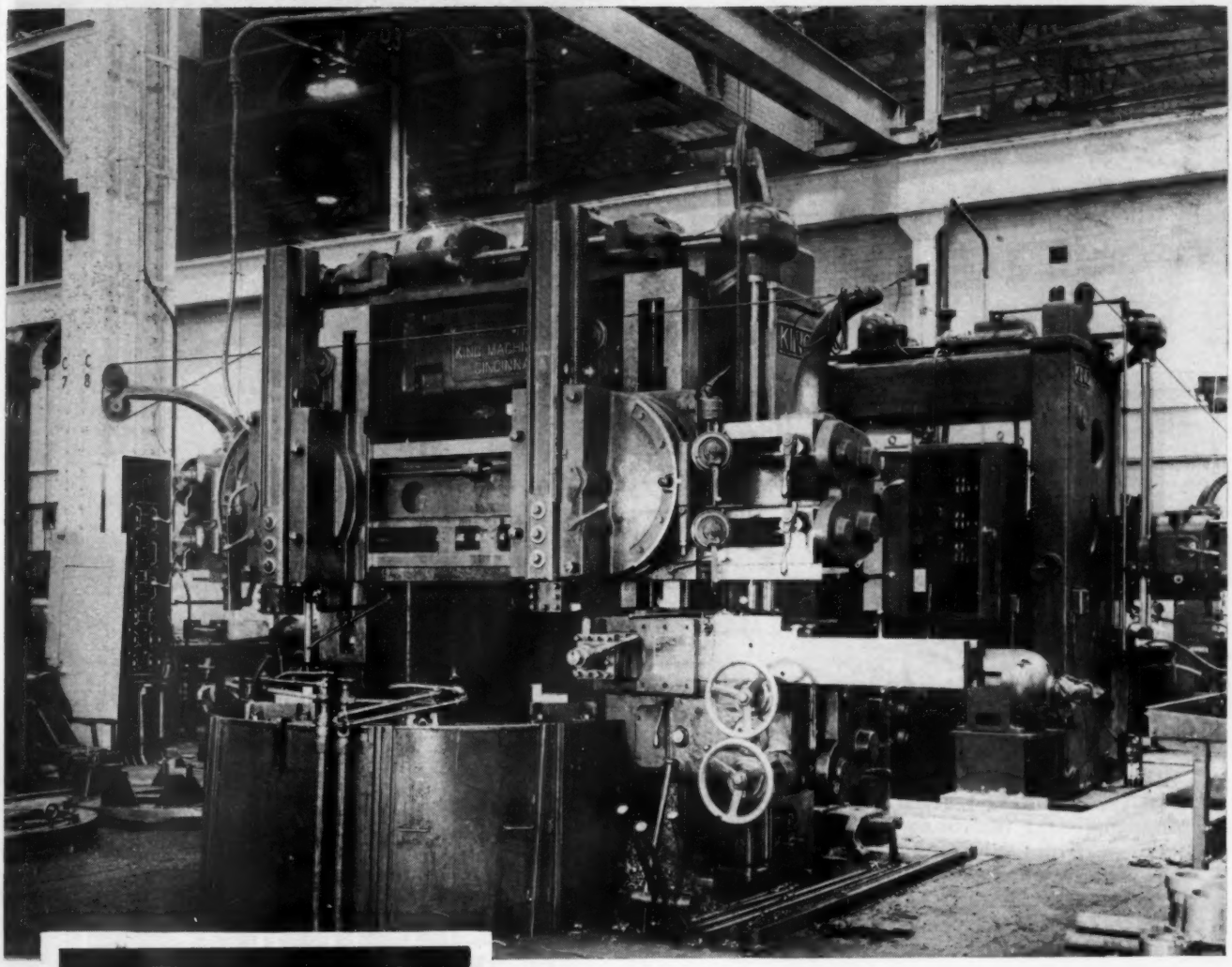
by SLOCOMB

SLOCOMB MICROMETERS ARE USED ALL OVER THE WORLD

J. T. SLOCOMB COMPANY PROVIDENCE, R. I.

NEW YORK • CHICAGO • CLEVELAND • DETROIT

SAN FRANCISCO • LOS ANGELES • SEATTLE • DENVER • SYRACUSE



A BATTERY OF

KING BORING MILLS

Supporting the

HOME FRONT

● Today top production, on the home front, is vital to the continued advance of our forces in many battle areas.

This battery of King Boring Mills in one of America's prominent manufacturing plants is doing its part to keep production rolling.

Rigidity — that insures dependable accuracy . . . Power — ample to meet all the needs of heavy production . . . Speed — to provide maximum output are inherent qualities in King Boring Mills that make for dependable accuracy and low cost production.

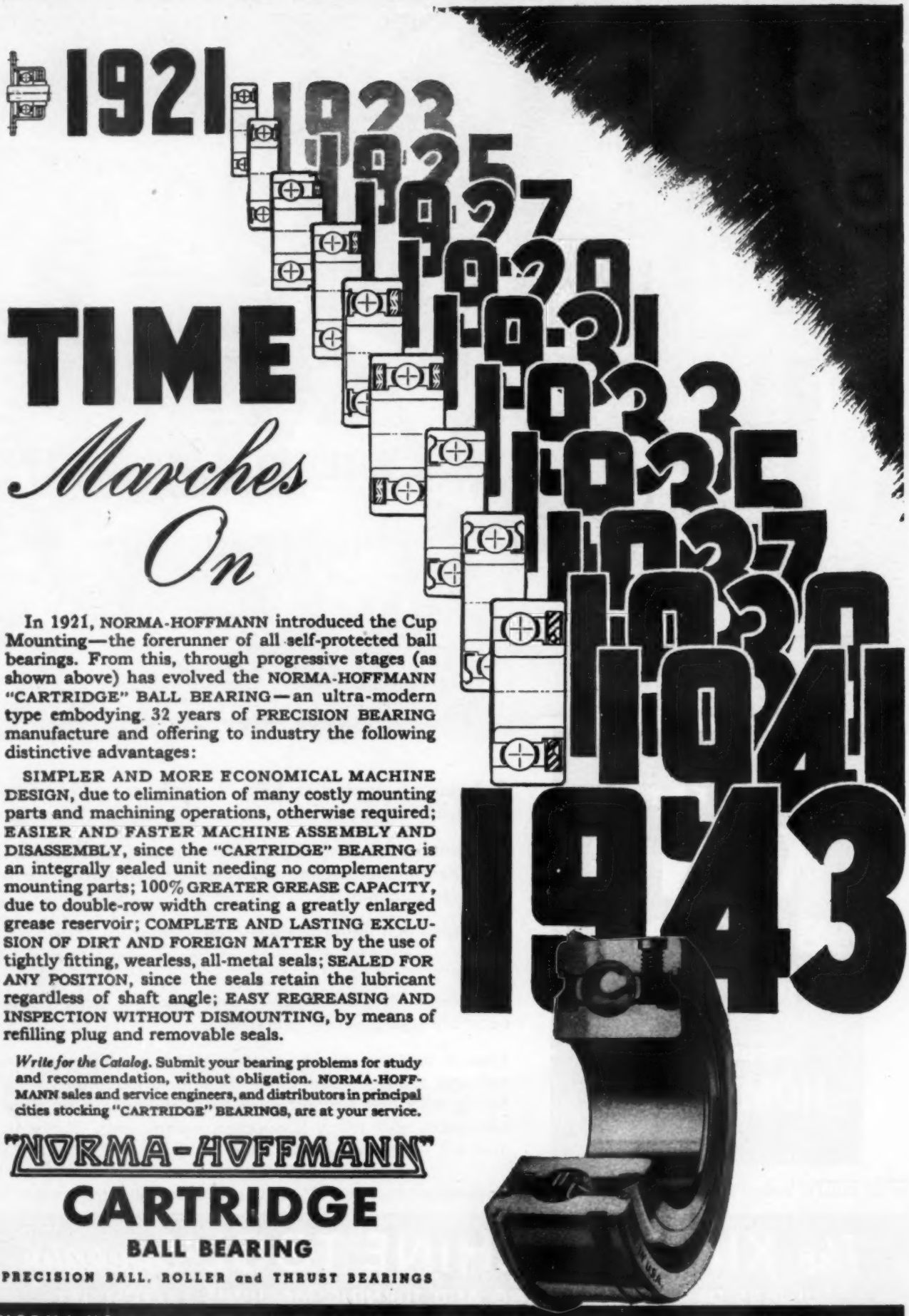
Thus in munition plants — tank plants — ship yards — railroad shops — and other manufacturing plants King Boring Mills are demonstrating their ability to meet close tolerances and tough production assignments. Put your next job on a King Boring Mill.

KING BUILDS Vertical Boring and Turning Machines in single column types from 30″ to 42″ and double column types up to 10 feet

The KING MACHINE TOOL *Company*

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

CINCINNATI, OHIO



TIME *Marches On*

In 1921, NORMA-HOFFMANN introduced the Cup Mounting—the forerunner of all self-protected ball bearings. From this, through progressive stages (as shown above) has evolved the NORMA-HOFFMANN "CARTRIDGE" BALL BEARING—an ultra-modern type embodying 32 years of PRECISION BEARING manufacture and offering to industry the following distinctive advantages:

SIMPLER AND MORE ECONOMICAL MACHINE DESIGN, due to elimination of many costly mounting parts and machining operations, otherwise required; EASIER AND FASTER MACHINE ASSEMBLY AND DISASSEMBLY, since the "CARTRIDGE" BEARING is an integrally sealed unit needing no complementary mounting parts; 100% GREATER GREASE CAPACITY, due to double-row width creating a greatly enlarged grease reservoir; COMPLETE AND LASTING EXCLUSION OF DIRT AND FOREIGN MATTER by the use of tightly fitting, wearless, all-metal seals; SEALED FOR ANY POSITION, since the seals retain the lubricant regardless of shaft angle; EASY REGREASING AND INSPECTION WITHOUT DISMOUNTING, by means of refilling plug and removable seals.

Write for the Catalog. Submit your bearing problems for study and recommendation, without obligation. NORMA-HOFFMANN sales and service engineers, and distributors in principal cities stocking "CARTRIDGE" BEARINGS, are at your service.

"NORMA-HOFFMANN"

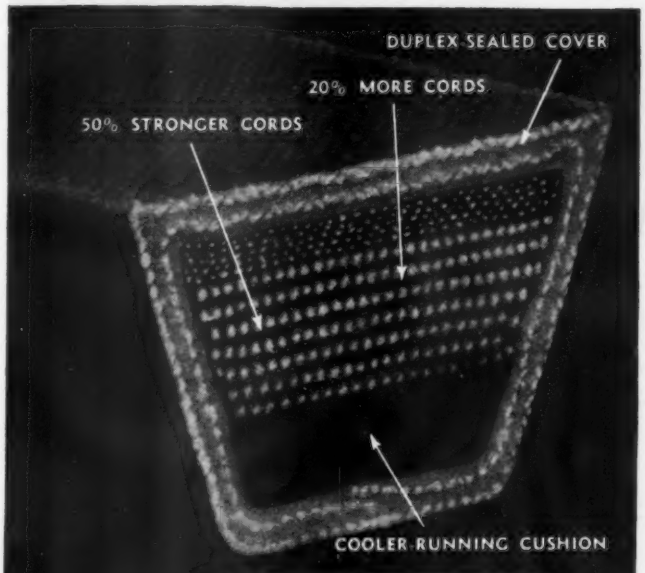
CARTRIDGE

BALL BEARING

PRECISION BALL, ROLLER and THRUST BEARINGS

NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN., U.S.A. • FOUNDED 1911

HOW TO Give V-Belt Wear the new "One-Two"!



1 BUY THE BEST BELTS...

You're 'way ahead of maintenance worries when you get the new Texrope Super-7, with revolutionary design-against-wear. 20% *more* cords — special-treated by the new Flexon process to make them 50% *stronger* — fight stretch. A cool-running rubber cushion "floats" cords around sheaves. Duplex-Sealed cover guards belt against grit, grime, moisture. When you *do* need new V-belts *invest in the best* — Texrope Super-7!

2 USE THE BEST CARE...

Want to make your present belts last *longer?* You can, no matter what brand you're using. Allis-Chalmers' new handbook: "Plain Facts on Wartime Care of Rubber V-Belts", gives you the "know-how" with tips on *what determines V-belt life expectancy... good rule-of-thumb for tension* ...and a lot more. It's jam-packed with valuable data — ideal for training new men. Tear off the coupon below and send for your *free* copy... today.

ALLIS-CHALMERS

TEXROPE* SUPER-7 V-BELTS

WE WORK FOR VICTORY — WE PLAN FOR PEACE

*Trade mark registered U. S. Patent Office. Texrope Super-7 V-Belts are the result of the cooperative research and design genius of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by Allis-Chalmers. Available in all sizes.

ALLIS-CHALMERS MFG. CO.
Milwaukee, Wisconsin

Gentlemen:

Yes, I would like to receive free of charge a copy of your "Plain Facts on Wartime Care of V-Belts".

(Name)

(Title)

(Company)

(Street Address)

(City and State) A 1643-6

2 New Developments make news!

SKIN DISORDERS RANK FIRST IN OCCUPATIONAL DISEASES IN OHIO

896 Claims Filed in First Half of '43

COLUMBUS, OHIO—What doctors and chemists call "dermatitis" is now the most frequently reported occupational disease, it was disclosed today. This is an infection or inflammation of the skin from industrial oils, cutting compounds, lubricants, dust, liquids, fumes or vapors.

With plants all over Ohio producing machine tools, guns, shells, tanks, planes and other weapons, the number of claims for dermatitis from contact with oil was 896, about four times the number filed in an ordinary year. This

NEW ELECTRIC AIR CLEANER ELIMINATES OIL MIST IN INDUSTRY

Removes Common Source of Skin Disorders

CLEVELAND, OHIO—Oil coolant mist from high-speed cutting and grinding operations is now eliminated at its source—right at the individual machine tool—by a new application of Precipitron, the Westinghouse Electric Air Cleaner.

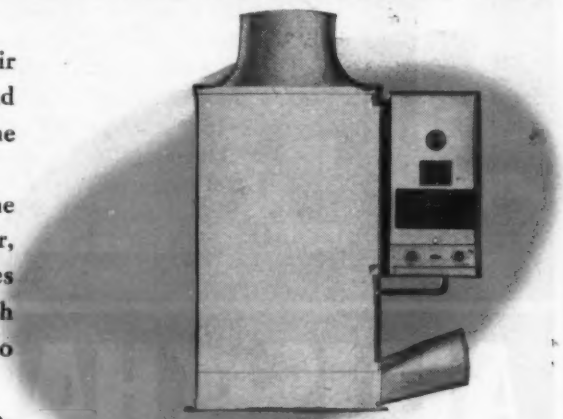
Easily installed beside a machine tool, this new Precipitron Unit captures the oil mist, then recirculates the cleaned air. Moreover, the oil removed from the air is salvaged can be used over again.

This newest use of *Precipitron**—the Westinghouse Air Cleaner that operates by electricity—can bring to an end the "oil mist" problem, and at the same time, alleviate one common source of dermatitis.

Because it removes more than 90% of all air-borne particles as small as 1/250,000 of an inch in diameter, Precipitron is today performing *many* air cleaning miracles for America's vital war plants. If you are not familiar with this revolutionary Westinghouse product, we urge you to investigate it without delay.

Just write Westinghouse Electric & Manufacturing Company, Edgewater Park, Cleveland, Ohio, for booklet B-3266.

*Trade-mark registered in U. S. A.



New Precipitron Unit for oil mist removal

Westinghouse Precipitron

PLANTS IN 25 CITIES ○ OFFICES EVERYWHERE

Tune in on John Charles Thomas, NBC, Sundays, 2:30 p.m., E.W.T.

Electronics at Work

Ten types of Surface Broaching Cuts

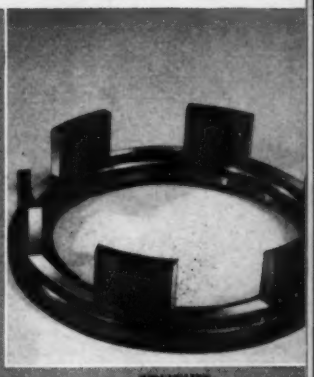
FOR FASTER, MORE ECONOMICAL MACHINING

★ Here are just a few of the types of cuts that are being used in surface broaching to show remarkable saving on war contracts. Many jobs that were slow and expensive when handled by conventional machining methods are now being surface broached faster and cheaper on Footburt machines. Production in most cases is as fast as the speed at which parts can be loaded, yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you. Send your blueprints and production requirements.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

SLOTTING
Deep slots broached on both ends of piece.



TONGUES
Parts indexed to form several tongues in one clamping in fixture.

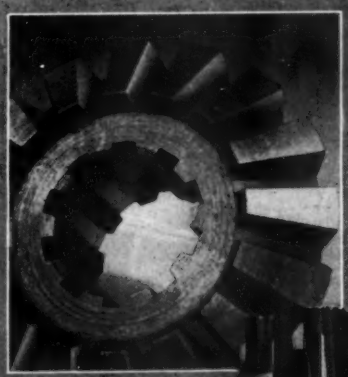
HEXAGON NUTS
Hexagon cuts broached on nuts and shank in one pass through broach.

SECTOR TEETH
Spiral teeth roughed in one pass through broach.

STRADDLE CUT
Both sides of boss formed by

FORM BROACHING
Golf Club Head formed with variations of cut to

TRIMMING
Gates broached from cast steel



BEVEL GEARS
Teeth roughed on bevel gear with

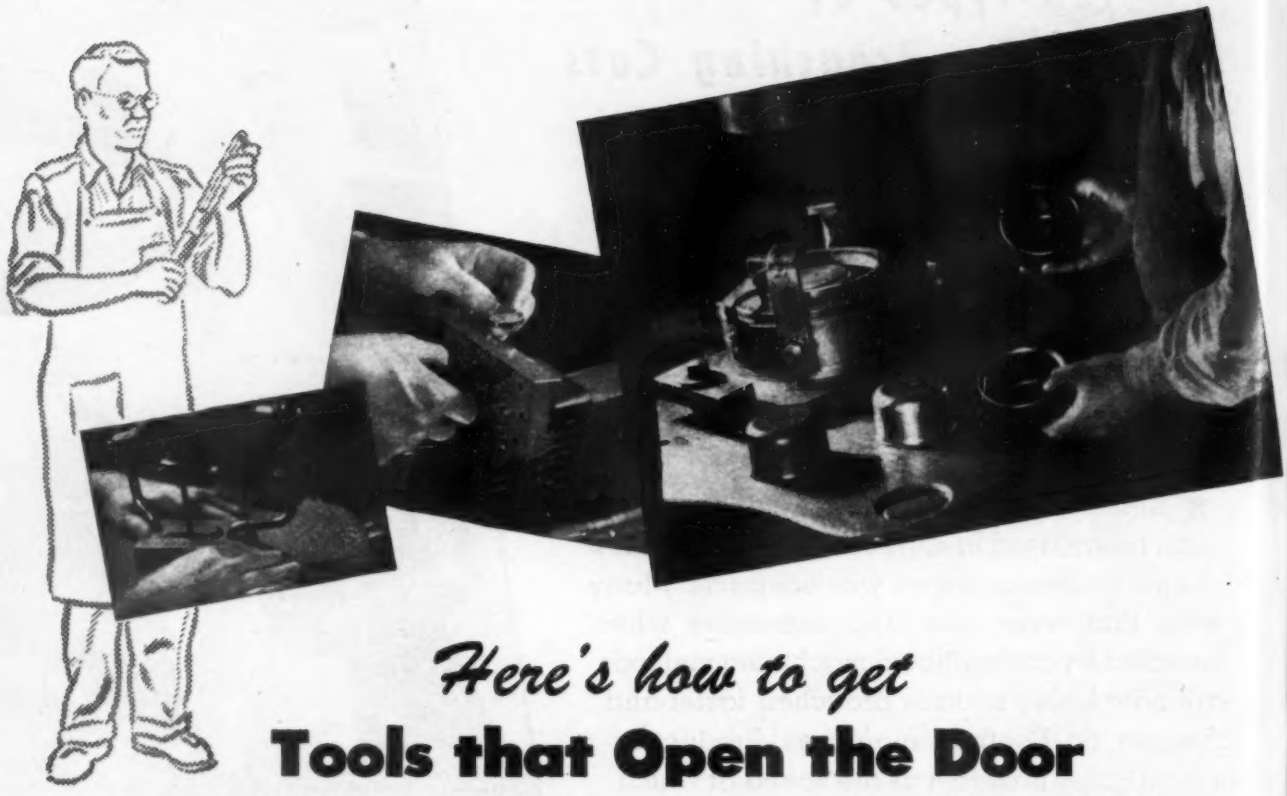
SERRATIONS
Pipe Wrench Jaws, Pliers, etc., broached complete.

FLATS & GROOVES
Piece 13" long broached with flats and grooves.

25 Ton 66" Stroke Duplex Surface Broaching Machine

MOVE UP THE SCHEDULE ★ WIN THE WAR QUICKER

FOOTBURT *Surface* BROACHING



Here's how to get

Tools that Open the Door to Increased Output per Machine

In most plants, machine and press speeds are continually checked. But still another way to get more output is to *make a study of machine shutdown time.*

And your tool room is the place to *start* the job of eliminating idle machine time. For the common causes of production delays—repairing, regrinding and replacing tools that fail prematurely—can often be traced directly to improper selection and heat treatment of the tool steels used.

In thousands of plants, Carpenter is helping to get at the causes of these delays. Through the Carpenter Matched Set Method of selecting tool steel, a definite *system* is provided for picking the *one* tool steel that will do each job best. Typical examples of the results of using this method are shown on the opposite page.

But Carpenter's aid to tool steel users includes more than help in the selection of the proper tool steel for each job. For example, the Tool Steel Manual shown below can be used to insure correct heat treatment of each tool. And "Tool Steel Simplified" contains page after page of useful trouble-shooting information. Send for any of this material you may need . . . and remember that your nearby Carpenter representative is ready to give you the benefit of his diversified experience with tool steel problems. Call on him whenever the need arises.

Put These 3 Tool Room "Assistants" to Work on Your Problems!

FREE

"How to select the proper tool steel for each job—and heat treat tools for best results"— could have been the name of this 167-page manual. It contains an 80-page Tool Index and Steel Selector, alphabetically indexed by kinds of tools. A flip of the pages guides you to the proper steel for each tool—and then you find simple, complete and easy-to-use heat treating instructions. Free to tool steel users in the U. S. A.

$1.00 in U.S.A.

This 315-page handbook, "Tool Steel Simplified", is packed with facts for "refreshing" skilled tool makers and training new men. Over 49,000 copies are being used by men in industry to answer questions on tool design, heat treatment, trouble-shooting, etc. Order as many as you need today. It is available *at cost* ($1.00 a copy) in the U. S. A. —$3.50 elsewhere.

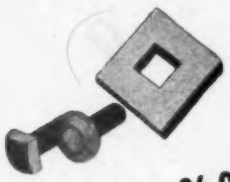
FREE

Spark Testing is useful in segregating tool steel scrap, identifying mixed stocks and checking the identity of the steel before tools are heat treated. And this 21" x 32" wall chart contains all of the basic information you need to train men to quickly identify different types of tool steel. It gives information on spark characteristics caused by major alloys, grinding wheel speeds, etc. Send for your free copy today.

The Carpenter Steel Company • 105 W. Bern St., Reading, Pa.

three case histories

that show how you can use the Matched Set Method to reduce machine shut-down time and increase output—



From 7,500 to 86,000 Pieces Per Grind!

THE JOB: Trimming cold forged blanks for machine bolts and cap screws from SAE 1020.

PROBLEM: Excessive breakage when tools were left hard enough to provide maximum wear resistance. But when drawn back far enough to eliminate breakage, tools needed too frequent redressing. Even though several tool steels were tried, machine shut-down time and lost production resulted.

SOLUTION: The Tool Engineer needed a tool steel with a good combination of hardness and toughness. Referring to the Matched Set Diagram, he selected *Carpenter No. 11 Special* straight carbon (tough timbre) tool steel, and got these results:

1. Breakage was licked—production up from 7,500 to 86,000 pieces per grind.
2. Production time between grinds jumped from 5 to 60 hours—eliminating 1 hr. and 12 min. shut-down time per day.
3. Extra output = 1,728 pieces per machine per day.

For Greater Toughness He Followed the Diagram . . .

THE JOB: Piercing slots in 14 gauge hot-rolled steel—at 1,200 pieces per hour.

PROBLEM: The piercing die would break after about 2,500 pieces. Heat treatment and hardness were OK, so the Superintendent checked the Carpenter Matched Set Diagram for a steel with greater toughness.

SOLUTION: Referring to his "Matched Tool Steel Manual", and following the Matched Set Diagram he found that *Carpenter R. D. S.* was the steel best suited for the job. And here are the results:

1. Tool life increased from 2,500 to 1,000,000 pieces.
2. Production up 39,400 pieces per month.
3. 33 hours of tool-caused idle press time were eliminated every month.

Better Wear Resistance Gave Longer Tool Life!

THE TOOL: A cut-off blade for shearing ball bearing slugs.

PROBLEM: Tool life was too short, causing frequent replacement and much wasted time. A tool steel with maximum wear resistance was indicated.

SOLUTION: The solution was easy with the Matched Set Diagram on the job. The Tool Room Superintendent selected *Carpenter Hampden* for the job. With *Hampden*, shut-down time decreased and production per tool was increased 30%.

A Tool that

causes production line casualties fails to meet its obligation to the men overseas.

These case histories are not unusual. They are *typical!* If you would like more information on how this workable method can help you, ask for a copy of the Carpenter Matched Tool Steel Manual—shown on the opposite page.

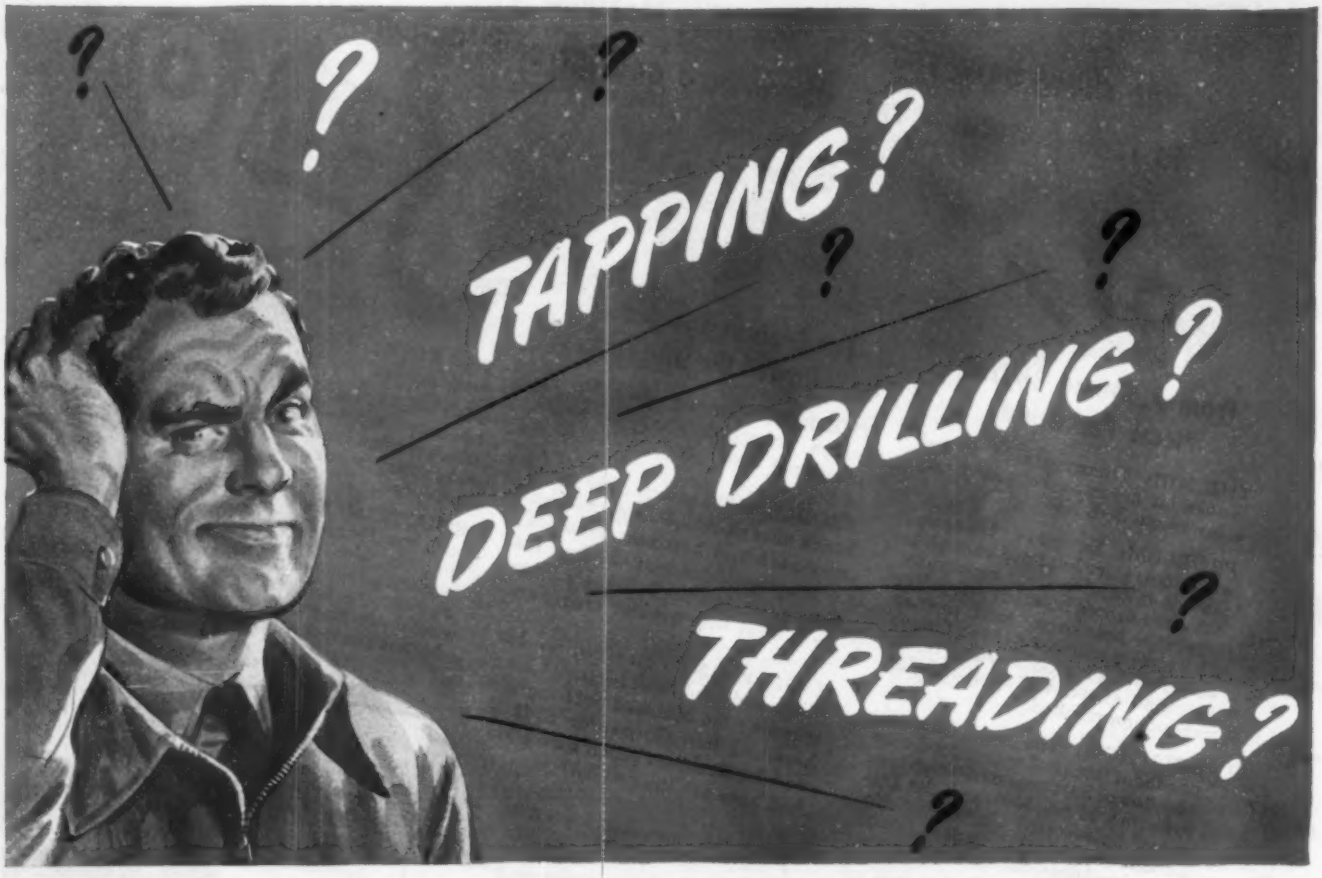
And for personal help with your problems of "tooling up" and increasing output per machine, get in touch with your nearby Carpenter representative. To get the most from every pound of tool steel you use, put his diversified experience to work on *your* problems.

Carpenter MATCHED TOOL STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

YOU NAME IT . . . WHICH IS THE

TOUGHEST LUBRICATION JOB IN YOUR PLANT?



They're all jobs for MARATHON 850-A Cutting Oil

A GENERAL PURPOSE cutting oil will not touch the assignment of difficult drilling, tapping and threading operations.

That's why you'll welcome Marathon 850-A Cutting Oil. It has the special ingredients, the special compounding needed to lick those difficult jobs. Experience shows it is a superior coolant, has marked anti-weld characteristics . . . reduces smoke to a minimum or eliminates it entirely. It flows freely, moves quickly to the point of contact.

On *your* machines, Marathon 850-A will prove itself, as it has in many plants where it is now delivering increased production with smooth finish and clean threads, prolonging tool life. Write, wire or phone . . . ask an Ohio Oil Company lubrication engineer to call with the convincing facts.

DILUTE IT 10-TO-1

Marathon 850-A should be used straight for the tough jobs. On less demanding operations it can be diluted as much as 10-to-1.

A COMPLETE LINE OF CUTTING AND GRINDING OILS FOR EVERY METAL WORKING OPERATION

MARATHON

The OHIO OIL COMPANY

GENERAL OFFICES: FINDLAY, OHIO

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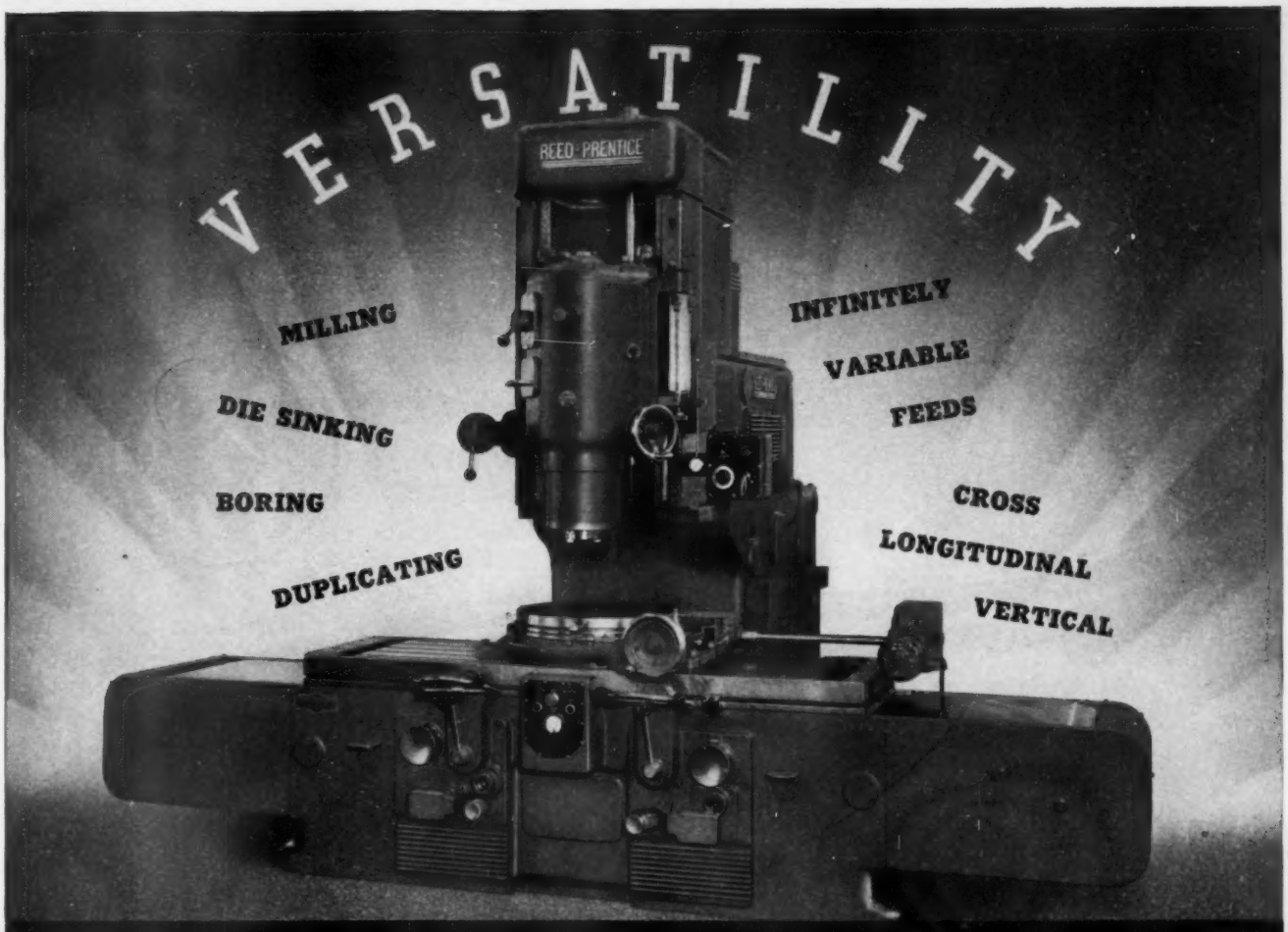
PRODUCERS OF PETROLEUM SINCE 1887

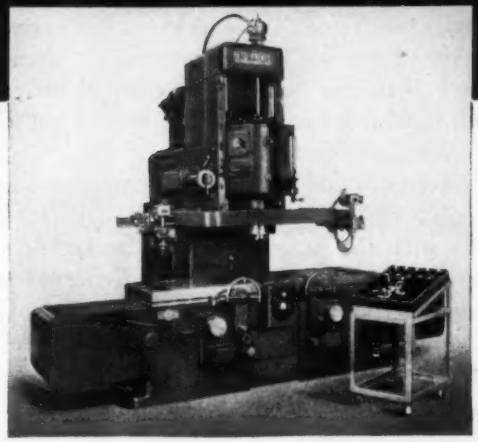


No. 4 VERTICAL MILLER

Whatever your requirements for accurate heavy duty milling, die sinking, or boring, the Reed-Prentice No. 4 deserves your consideration.

- ▶ Table and cross slide movement through hydraulically actuated screws giving infinitely variable feed rates.
- ▶ Power down feed controlled through electronic unit for smooth and infinitely variable feeds.
- ▶ All controls centralized within easy reach of operator.
- ▶ Large table, 24" x 84". Longitudinal travel 48". Cross slide travel 24".

Our sales engineers will be pleased to supply you with complete details.



NO. 4 MILLING MACHINE EQUIPPED WITH DUPLICATING ATTACHMENT

Duplicator can be supplied with either dual unit for two dimensional profiling or single unit for vertical die sinking. Extremely rapid reproduction can be effected, even with inexperienced operators.

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REED-PRENTICE CORP.

MAIN OFFICE
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Prompt
Delivery

Still Shorthanded? DO THIS NOW:

Analyze your operations in the categories listed here. Maybe they're not bottlenecks . . . but perhaps they are places where you're inadvertently "hoarding" manpower that you could use better elsewhere. Flexible shaft equipment can do any of these hand jobs . . . and do them *faster* and *better*.

Where you find flexible shaft equipment will help, we strongly recommend Kellerflex . . . Pratt & Whitney-built with the same experience and ability that goes into P&W basic machine tools. Kellerflex is available in many types and sizes, with accessories for every kind of job. P&W engineers will help you select the right equipment. Changeover from hand work to Kellerflex can be managed overnight, freeing workers for other assignments. You'll be surprised what these machines accomplish in women's hands. *And when your war work is done, you'll have capable equipment to give you a flying start on peacetime production.*

Prompt deliveries. Consult your nearest Pratt & Whitney branch office, or contact headquarters: Kellerflex Sales Dept., Pratt & Whitney, *Division* Niles-Bement-Pond Company, West Hartford, Conn.

CHECK YOUR BOTTLENECK:

- ☐ BURRING
- ☐ DIE FINISHING
- ☐ DRILLING
- ☐ FILING
- ☐ GRINDING
- ☐ LAPPING
- ☐ POLISHING
- ☐ SANDING
- ☐ SNAGGING
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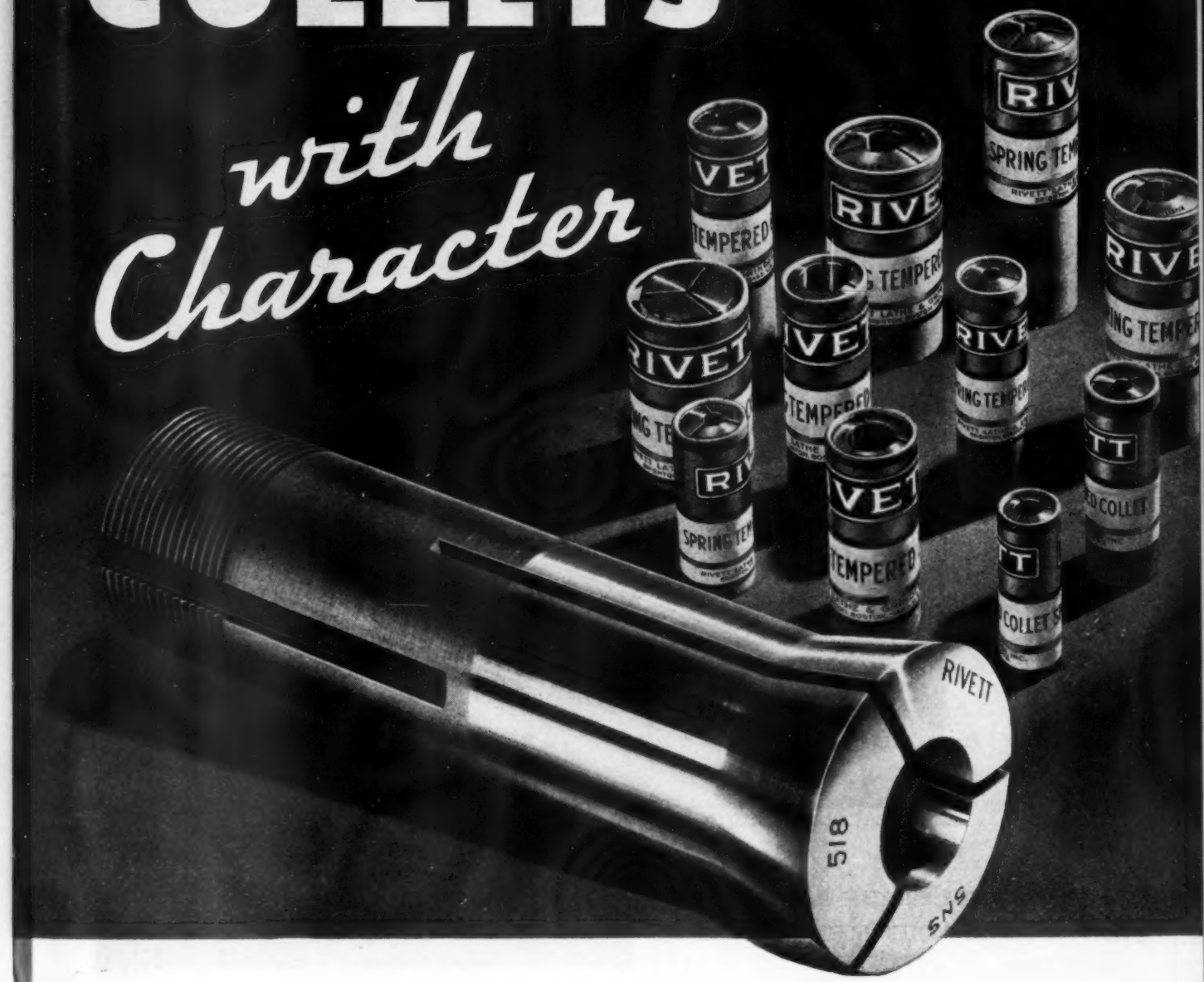
✓ *Give the Job to Kellerflex*

KELLERFLEX

COLLETS *with Character*



A RIVETT DRAW-IN COLLET has personality derived from a worthy inheritance and a steadily improved environment. Today when a RIVETT COLLET is shipped in its distinctive carton it reflects fifty years of experience and the most advanced methods in manufacture and inspection.

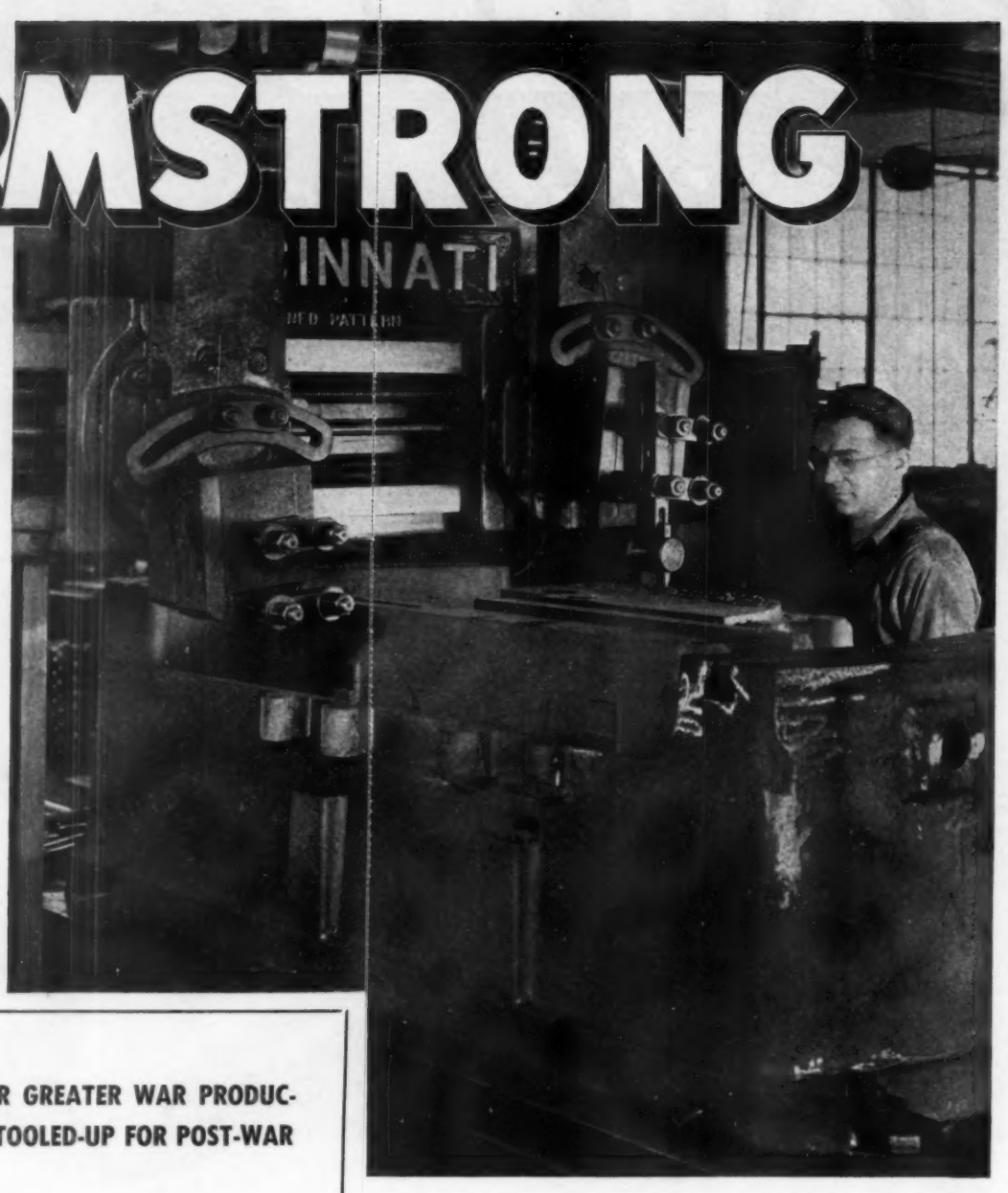
RIVETT DRAW-IN COLLETS are available in all standard styles for bench lathe, engine lathe, miller and grinder use. Work held in a RIVETT COLLET is guaranteed to run "dead true" at the collet mouth and within .002" two inches from the collet mouth. For complete information on all RIVETT COLLETS and their adaptation to existing machines write for Bulletin 100.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

ARMSTRONG



TOOL-UP NOW FOR GREATER WAR PRODUCTION . . . AND BE TOOLED-UP FOR POST-WAR COMPETITION.

Equip every lathe, planer, slotter and shaper with a complete set of ARMSTRONG TOOL HOLDERS — with the correct types and sizes for every operation. While the extra strength and ready adaptability of ARMSTRONG TOOL HOLDERS make it possible to "get by" with a minimum of types and sizes, the correct ARMSTRONG TOOL HOLDERS will permit greatly increased production on each operation — will permit speed and feeds often double so-called "Standard" speeds and feeds, without loss of cutting efficiency.

Tool-up completely now with ARMSTRONG TOOL HOLDERS to increase your War Production and you will also be tooled-up for post-war competition, because each ARMSTRONG TOOL HOLDER is a permanent, multi-purpose tool that will not only outlast the war, but with the change of a cutter, will be ready to start on post-war production.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE. CHICAGO, U. S. A.

Eastern Warehouse & Sales Office:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

Here are 10 Bullard Mult-Au-Matics, each having 8 spindles. 80 of these are doing their share for the war effort working on airplane engine parts. Of course, 10 of the total number of stations are loading stations, but the 70 are finishing their operations every few seconds. Each station has independent feeds and speeds, and all operate simultaneously. As fast as the operator can load and the machine indexes, there comes out a finish machined piece.

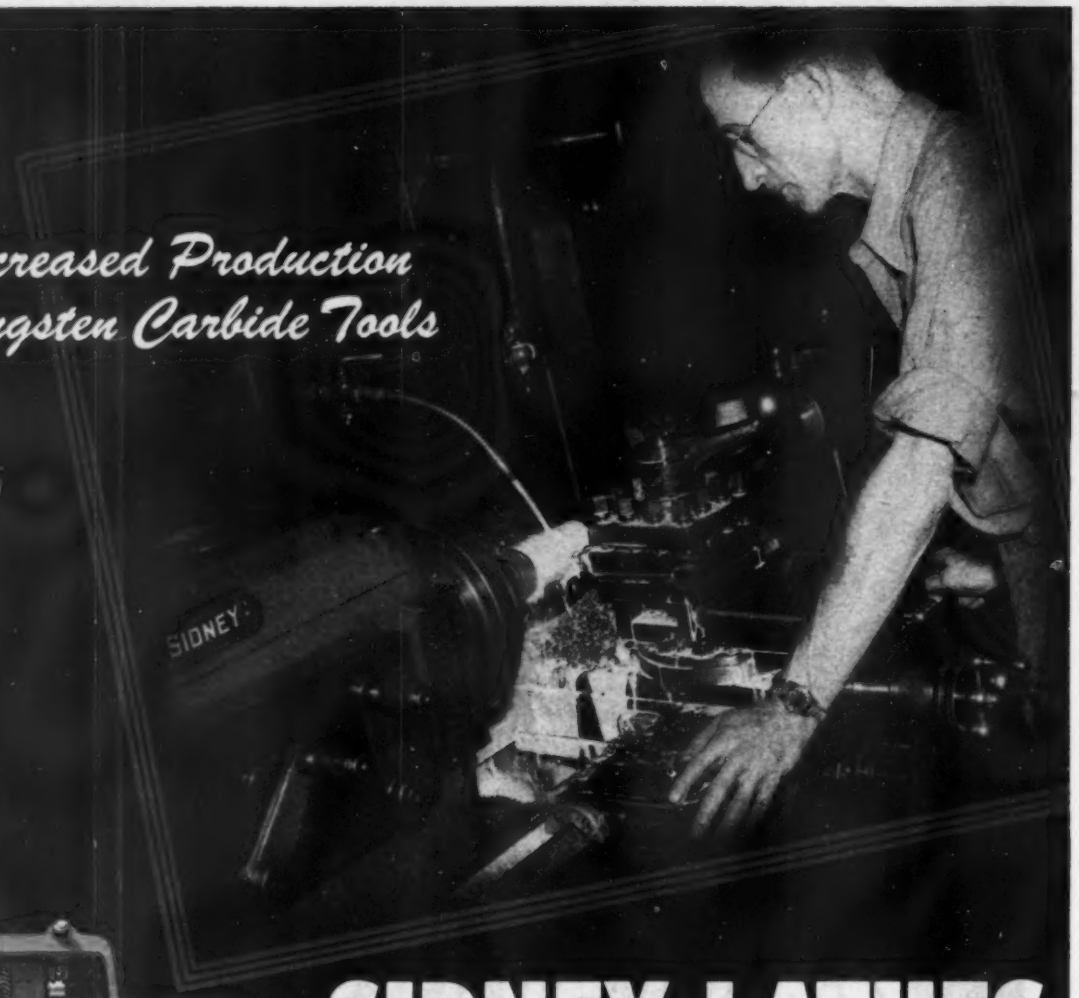
Hundreds of such batteries of Mult-Au-Matics in plants all over this country and in those of our allies are every day beating Hitler and the Japs to the punch.

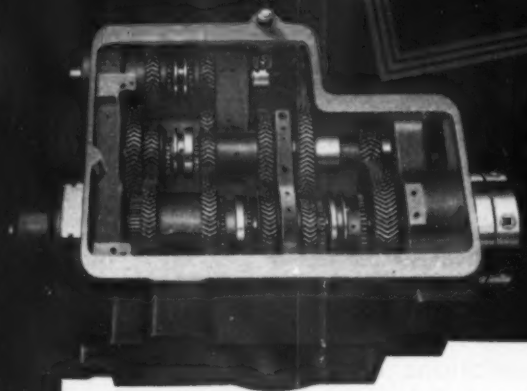
These machines are mechanical soldiers of Industry, and Bullard is proud that other War Industries have accepted them for their accuracy, stamina and all-out production.

The Bullard Company

BRIDGEPORT 2, CONNECTICUT

For Increased Production with Tungsten Carbide Tools





SIDNEY LATHES

WITH CONTINUOUS TOOTH HERRINGBONE GEARS

SIDNEY

● To use cemented tungsten carbide tools to the fullest possible advantage the machine tool on which these cutters function must be designed and built to economically operate at increased cutting speeds. The machine must be free from vibration and interrupted tooth engagements with adequate power transmitted thru the gear system to the spindle.

All these requirements are met in the modern design, precision-built SIDNEY continuous tooth, 30° helix, herringbone transmission. Gears are in constant engagement, selective spindle speeds being obtained by sliding clutches of the internal and external involute tooth type, with an absolute minimum of backlash, operating on ground multiple spline shafts. The inherent accuracy of the headstock transmission means longer life and reduced tool costs.

Illustration showns a SIDNEY lathe in production on war work equipped with 4-way turret and carbide tipped tools taking deep cut at high surface speed on heat-treated chrome-nickel steel part.

To meet the urgent demand for increased production SIDNEY Lathes, of advanced design and smooth flow of power, merit your serious consideration.

Bulletins on all types are readily available.

The SIDNEY MACHINE TOOL Company

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

ACCURACY

From Blue-Print to Battle

Catalog No. 101 gives complete details on METRO Gages both Plug and Ring and on all METRO TOOLS. Send for your copy.

METRO

TOOL AND GAGE CO.

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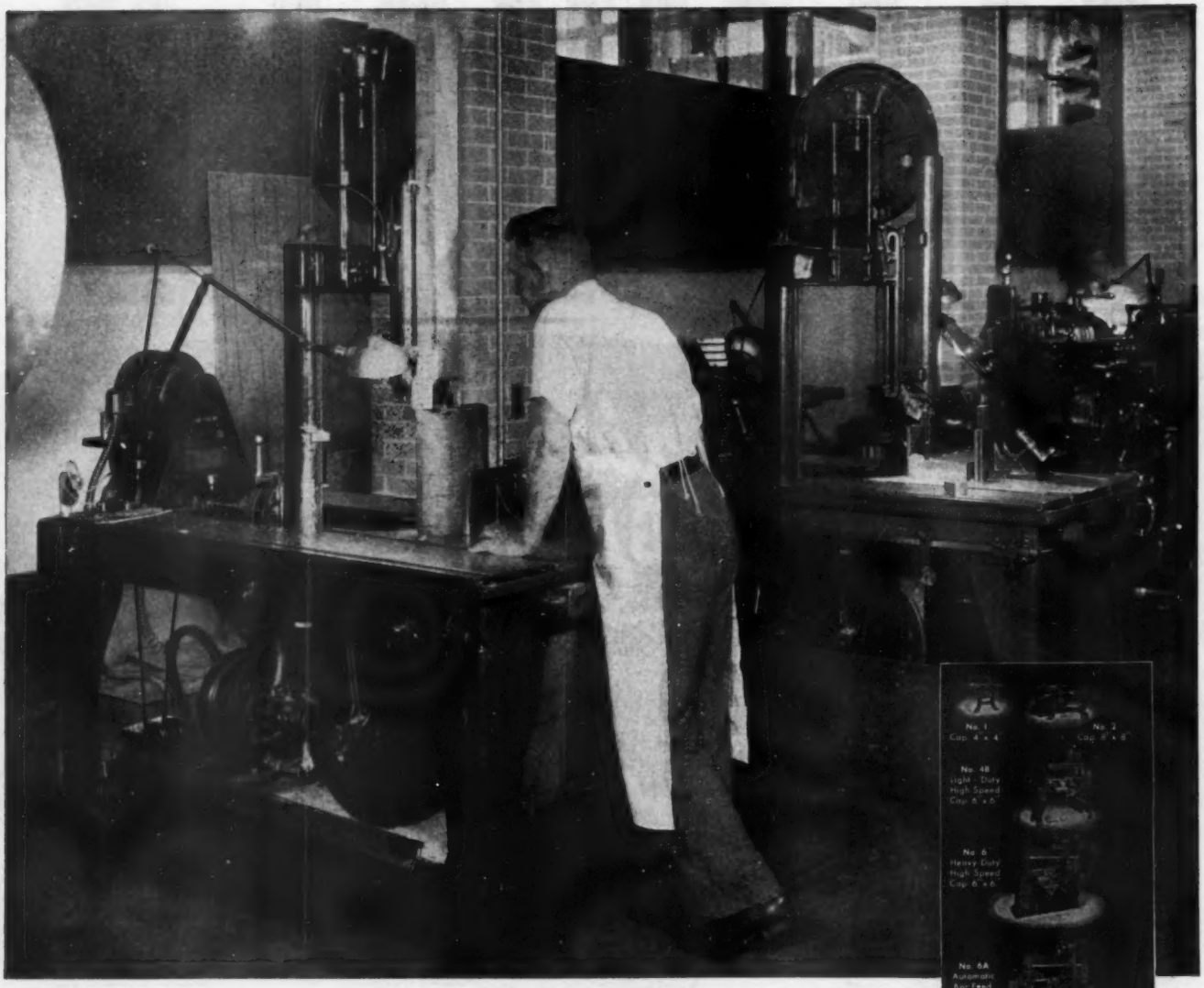
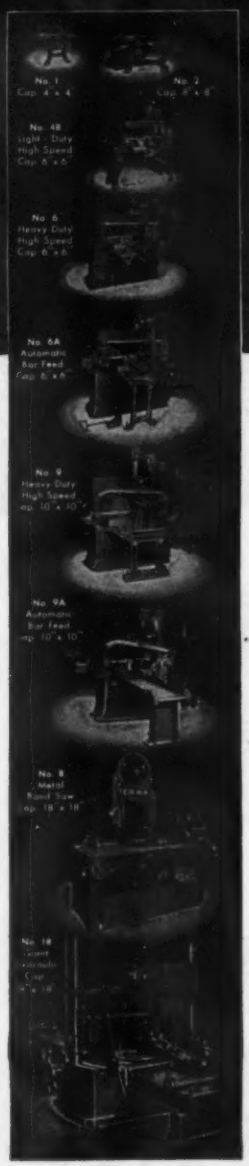




MARVEL SAWS

Research Laboratories need Versatile Saws

The research laboratory of the Aluminum Company of America uses the two MARVEL No. 8 Metal-cutting Band Saws, pictured here, to cut test specimens from alloy steels and aluminum alloy products of every shape and description, varying from 1/16" to 18" thick. The MARVEL No. 8 in the foreground has been in continuous service for 11 years and proved so "well suited for the large variety of sizes and shapes to be sawed", that the modern MARVEL No. 8 behind it was added.

ARMSTRONG-BLUM MFG. CO.

"The Hacksaw People"

5700 BLOOMINGDALE AVE. CHICAGO, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York

"6 HOURS ON OUR NEW BICKFORD"

(Instead of 9 hours previously)

THE SUPER SERVICE RADIAL

"Perfect" is the way the performance of this Super Service Radial is described by Mr. J. A. Bertsch, Vice President of Bertsch & Co., Cambridge City, Indiana.

The part being machined is a 6000 pound housing for plate leveling roll. Operations include 1⅞" lead drilling with 3⅜" three-lip drill to follow; holes are then reamed to 3 7/16" to a limit of accuracy of —0, + .002 in. Four holes are reamed in this set up.

On machine previously used the floor-to-floor time required for this job was approximately 9 hours. Since the installation of this Super Service Radial, time has been cut to 6 hours with a saving of about 33% in cost.

This machine is living up to the expectations of its owners who purchased it for its "accuracy and rigidity."

The reasons why Super-Service Radials meet all requirements are described in Bulletin R-24, available promptly on request. Write for details today.

ARMY E NAVY

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY • CINCINNATI 9 • OHIO • U. S. A.

WARNER & SWASEY field men have kept contact with hundreds of manufacturers throughout this war period. As production engineers they are offering their experience to help shops that converted to war and the hundreds of new plants that were built exclusively for war purposes.

In one large aircraft plant, they recommended changes in machining sequences that produced a volume on ten turret lathes equal to that of twenty turret lathes working under former method.

In a sub-contractor's plant they advised a different model machine than the ones being used for the same operation by the prime contractor; it resulted in greater production—and lower cost per piece.

In another war plant (one of the world's largest) a group of Warner & Swasey engineers worked for weeks, planning machines and layout for the entire metal turning department.

Many manufacturers, looking ahead, know transition from war to peacetime production must be accomplished quickly if they are to maintain employment. They realize that postwar competition will be keen—that only the most modern machines, techniques, and methods will keep them in front in the struggle for domestic and foreign markets.

Planning for postwar can be done now *without* impairing all-out production necessary to win the war. The war's end will bring new challenges—and American industry must be prepared to accept them.

IT IS PATRIOTIC TO PLAN NOW FOR THE POSTWAR ERA

Warner & Swasey offers you practical help on postwar planning. We have a corps of engineers who are skilled in all machine operations involved in production of precision parts made of metal. They are helping many war plants improve methods and machines for greater production. They will continue to do so, but their services are also available to management interested in planning now for the future. Write Warner & Swasey, Cleveland 3, Ohio.

YOU CAN TURN IT BETTER, FASTER, FOR LESS... WITH A WARNER & SWASEY

WARNER & SWASEY
Turret Lathes
Cleveland

What's In This Issue

Flat Belt, Round Surface

By developing a special work-holding fixture, Consolidated Radio Products Company is using a belt grinder for finishing cylindrical surfaces. The manner in which this was done, and the efficiencies and economies realized are outlined in an article by E. A. Heppner, vice-president, and H. J. Moskow, general manager. It appears on page 86.

Die and Fixture Storage

Modern methods developed for handling and storing dies and fixtures are told of in detail in an illustrated article by Ben C. Brosheer, associate editor, AMERICAN MACHINIST, which starts on page 88.

More Toolroom Milling

Part IV of the Toolroom Milling series by H. A. Frommelt, Kearney & Trecker Corporation is on page 94. In the current section, Mr. Frommelt describes — in captions accompanying photographs of the operations—milling splines, cutting threads and scale graduations, as well as the cutting of spiral grooves and cam tracks.

W. A. JOHNSON L. SCHULTZ

A Tool Saved

A central department specializing in the sorting, reworking and reclaiming of unused and damaged tools for International Harvester Company's 16 plants have saved that company nearly a ton of obsolete and surplus tools each month. The operation of the department and some of the methods it has utilized to return tools to use are described in an article starting on page 83, by Willis A. Johnson and Leroy Schultz.

F. W. McINTYRE

H. E. LINSLEY

L. T. RADER

Down Under Is Looking Up

Faced with the need for immediate, large scale war production, and unable to get deliveries of machine tools to make it possible, Australia built its own, and materially expanded its materiel production. F. W. McIntyre, vice president and general manager, Reed Prentice Corporation, writes of this development, in an article beginning on page 97.

Womanpower, Man Strength

By providing devices for doing the heavy work of lifting and shifting parts, Wright Aeronautical Corporation has made it possible for women to do many of the jobs formerly handled by men. H. E. Linsley of Wright gives the details on page 109.

Two to Make Ready

By designing and installing a rotating double-end table on the base of each multiple-spindle drill press, The Crane Company enables machine operators to set up and make ready a valve body or fitting at one end of the table while another piece is being drilled at the other. Down time has been cut to a minimum. The design and methods of using the tables are described on page 99, by G. C. Detlefsen, works manager, Crane Chicago plant.

Ere the Horse Is Stolen

Controlled sampling, and reliance on known laws of probability, is the answer to the problem of quality control. Page 92 starts an article by L. T. Rader, Industrial Control Engineering Division, General Electric Company, describing this method of time and material saving.

War Finish Makes Good

The success of a "victory" pebble finish developed by Cincinnati Bickford Tool Company and The Sherwin-Williams Company indicates possible postwar usage. On page 104, Gordon H. Robertson, of the latter company, tells the story.

Parts Scheduling

A rotary duplicating machine and an ingenious interchange of master forms enables the Wilson Mechanical Instrument Company quickly, simply and economically to produce integrated production schedules by types and parts. The method is described by A. A. Blue on page 102.

COMING

The orderly postwar disposal of surplus machine tools will require thorough planning and rigid control, opines Charles Simmons, president, Simmons Machine Tool Corporation, in a soon-to-be published article.

The United States Office of Education has made and released over 40 motion pictures showing how to set up and perform specific jobs on machine tools. Nearly 30,000 reels of these pictures are now being used to train machine operators. The scope of this program will be described in an early issue.

Spot Welding

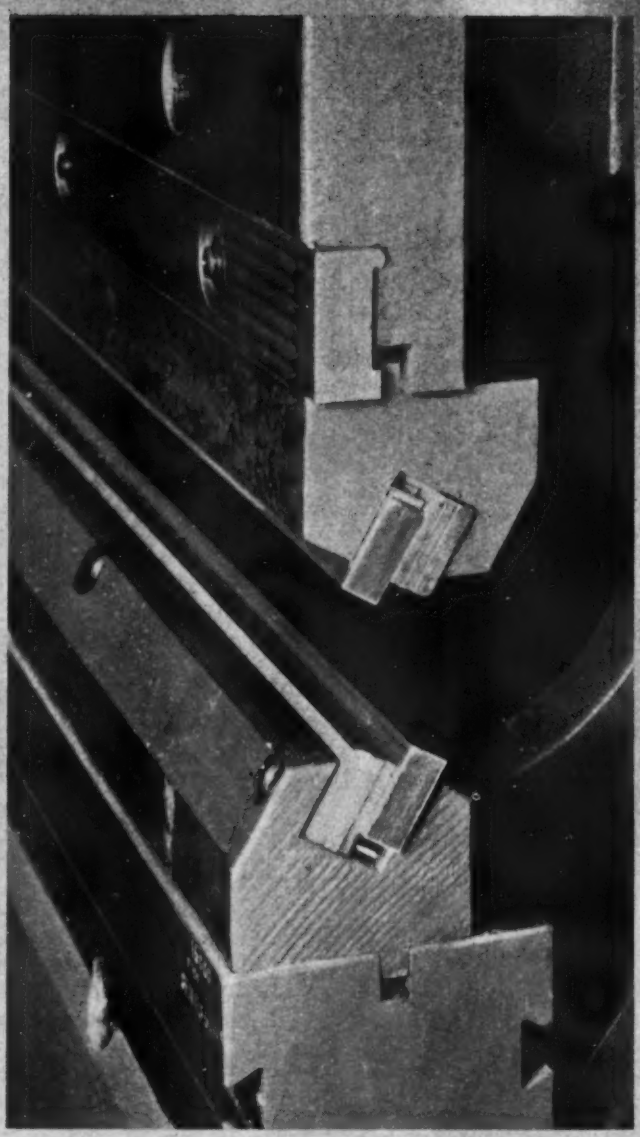
The second section of the resistance welding series, by R. T. Gillette and J. F. Young of the General Electric Company, is devoted to a discussion of spot welding, its uses and methods of application. Page 100.

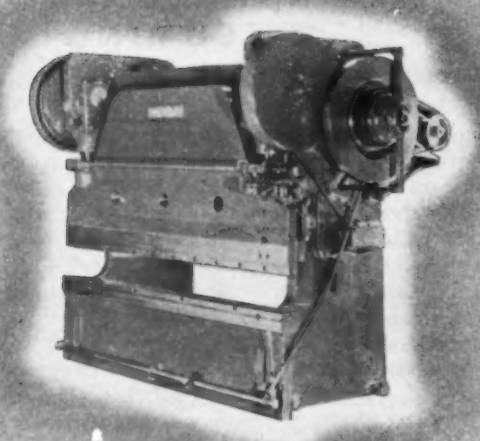
OFFSET BENDS...

Offset dies in one hit form offset bends that normally require two hits. These dies are usually single purpose. However, the Cincinnati Adjustable Offset Die, with a range of one hit offset bends, is very useful on occasion.

Cincinnati Press Brakes have the power and stamina necessary in developing the heavy pressures required for accurate, sharp offset bends.

Write for Catalog B-1





THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

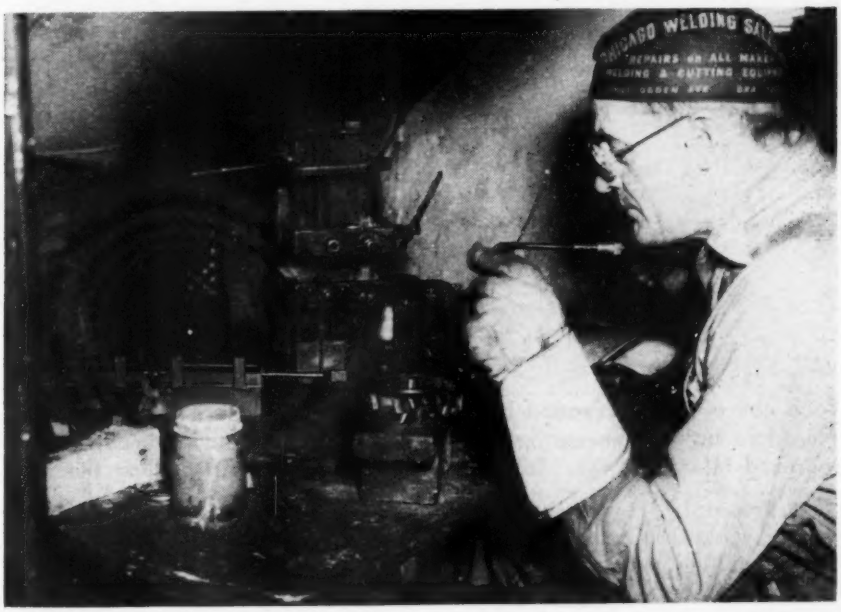
American Machinist

ESTABLISHED 1877 • BURNHAM FINNEY, EDITOR

Tool Reclamation Pays Its Way

BY WILLIS A. JOHNSON AND LEROY SCHULTZ, INTERNATIONAL HARVESTER COMPANY

Salvaged tools are sorted in a central department and shipped as needed to individual plants. New tools are ground from those worn undersize or with damaged cutting edges. Severely damaged tools are reclaimed by brazing



Milling cutters broken in two pieces are salvaged by tinning the surface of one piece and applying flux to the other piece. The two pieces are aligned on a preheated plate. An alignment plug is often used in the arbor hole

EARLY in the war production program, the International Harvester Company recognized that a critical situation would develop in the manufacture of cutting tools. Tool reclamation programs were immediately instituted in each of the company's plants for collecting tools in good condition, as well as those not usable because of being undersize, broken or obsolete.

Each plant soon had accumulated cutting tools which could not be reclaimed and applied economically to its own operations. Therefore, a central tool salvage department was set up in the Milwaukee works. Nearly a ton of obsolete and surplus tools have been shipped to this salvage department each month, about 75 percent of which has been withdrawn by the 16 Harvester plants for making other tools. In addition, approximately 15 percent of the company's requirements for cutting tools is now being furnished by the individual reclamation departments in several plants.

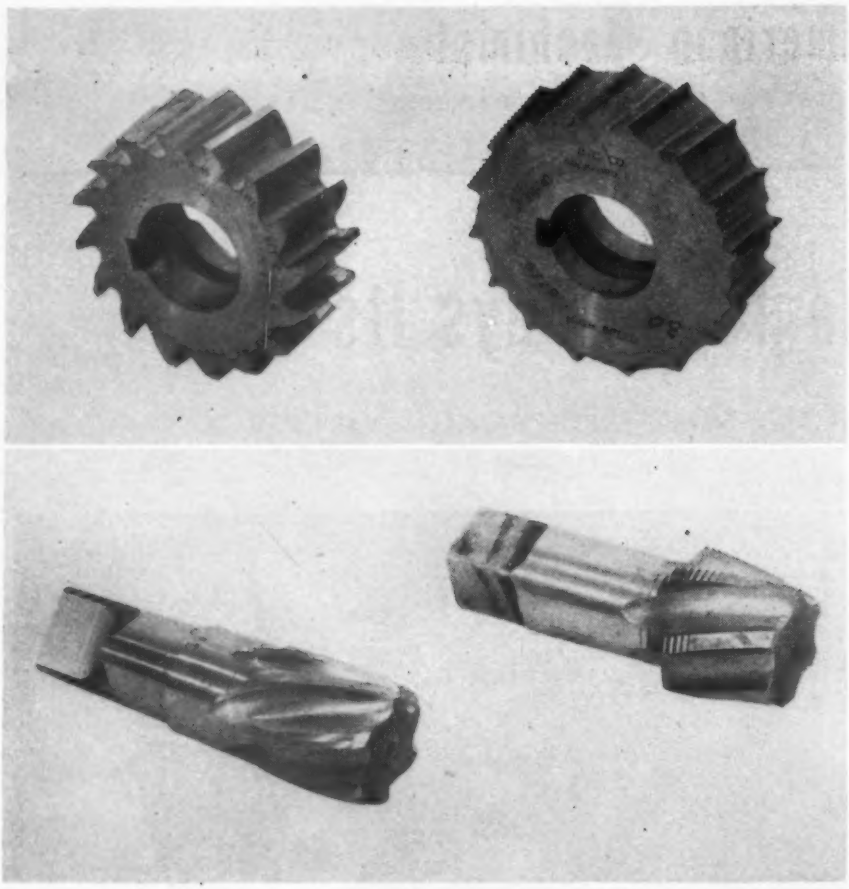
Aside from cutting tools, the salvage departments reclaim tool-steel bushings and locating blocks from obsolete jigs and fixtures. Punch press dies are reworked if possible, or stripped for salvaging the tool steel they contain. Dies shoes are saved for other jobs. These departments also reclaim grinding wheels and files, usually by sending them to outside contractors.

Requisitions for new tools are cleared through the reclamation department at each plant before purchase orders can be issued. The department therefore has an opportunity to furnish a tool which otherwise would be purchased from an outside source. Continuance of the reclamation program is insured by having each production department turn in an old tool, regardless of its condition, when a replacement is desired.

One widely used reclamation method consists of grinding hardened tools to new sizes of the same tool or to another form. For example, reamers worn undersize are ground to the next smaller size. Threads are ground from taps and the tool converted into an end mill or reamer. Spline and gear hobs are ground to remove thin or broken teeth, and the body is regashed to make a slab milling cutter or shell reamer. New teeth are ground on side and plain milling cutters, and slitting saws. Round broaches are reground to smaller sizes.

Conventional tool grinding equipment is used in reclaiming hardened tools. Soft wheels should be used, and the feed should be kept low so as to avoid burning the tool. When possible, rehardening the tool should be avoided, since the material from which the tool is made cannot always be ascertained, and it may be damaged beyond repair by reheat-treating.

The reclamation of tools by annealing and reworking tool-steel blanks is not too desirable from the standpoint of cost, equipment required and the performance of the tools after they



Tools can often be salvaged by grinding them to different sizes and forms. Here is a broken hob converted to a milling cutter, and an undersize tap reground into a reamer. Soft wheels are used to avoid burning the tools

are rehardened. However, the Milwaukee works has made up a number of milling cutters from blanks forged from annealed bodies of obsolete cutters, and they have been found reasonably satisfactory even though their cost was higher than that of new tools. The process does, however, have the advantage of making cutters available promptly. Some cutter bodies are annealed and forged into bars for making toolbits. Because of the difficulties involved in heat-treating cutters made by this method, this usually has been done on contract by heat-treating specialists.

The low-temperature brazing process is a satisfactory method of repairing damaged or broken cutting tools, and can also be used in the fabrication of new tools. Included among the tools reclaimed by this process are slitting saws, milling cutters, broaches and form tools. Short toolbits and special form tools have been brazed to mild-steel shanks. Also, extension reamers and drills have been made by brazing together short sections.

There are several rods used in the brazing process. They are chiefly alloys of copper, zinc, nickel, phosphorus, cadmium and silver. Melting points vary from 800 to 1600 F. The alloys used in tool brazing range in melting points from 1175 to 1300 F. These temperatures are very near the drawing temperatures of high-speed steel tools. To anneal a high-speed tool steel, it must be heated for a prolonged time at a temperature above its critical point. If the brazing heat is applied properly, the tool will not be annealed as it is heated for only a few minutes. For this reason, the welder must learn the correct manipulation of his torch so as not to harm the tool. He must not soak his heat, and should work so as not to cause stresses in the tool.

Careful preparation of the joints before brazing is an essential step in the process. If the break is clean and even, and there are no fractures involving several small pieces, it is better not to grind the joint surfaces. Interlocking of broken surfaces is desirable. If the break is at an angle, or is ragged, the ends should be ground. It may be desirable on larger tools to shotblast the ground surfaces lightly. Care must be used when shotblasting not to damage the cutting edges of the tool. Under no circumstances should sandblasting be substituted for shotblasting.

If a crack is to be brazed, outline the crack with a grinding wheel to provide a V-channel at the break on each side of the tool. This channel should be one-third of the way through the piece on thin pieces. Never apply a clamp across a break which is to be brazed, as the clamping pressure will squeeze out any flux between the joints and make it difficult to flow the brazing metal into the joint. Also, a clamp will set up stresses which might lead to cracks in the tool after the piece has cooled.

Next, thoroughly clean the surfaces to be brazed with carbon tetrachloride or by immersing in a vapor degreaser. Remove any hard accumulations of dirt with a brush, using a liquid cleaner or solvent. For final cleaning, use a soft bristle brush and carbon tetrachloride or a similar solvent.

The third step consists of coating the surface to be brazed with an autochemic flux which must be entirely liquid and active at temperatures below the flow point of the brazing alloy. Care must be taken to select a flux suitable for the alloy being employed. In general, use the flux recommended by the manufacturer of the brazing rod being used.

Next, preheat slowly with an oxyacetylene torch, using a "ragged" flame with a slight excess of acetylene. Such a reducing flame is desirable to eliminate oxidation as much as possible. Preheating is done to relieve stresses and to heat the tool evenly so that additional stresses will not be built up because of uneven heat in the body of the tool. It sometimes is desirable to preheat in a temperature-controlled furnace at 600 to 800 F., depending on the size and shape of the tool.

The method employed for preheating is determined by the skill of the operator. Flat cutters frequently are laid on a plate, and both the plate and the work are heated. Where the parts are assembled in a fixture, care must be employed in preheating. Excess heat must not be applied on the fixture, except as necessary in preheating parts of the tool. Also, more care must be used when preheating a solid tool than one which is cracked. Never touch a tool being brazed with a cold object. If necessary to apply a clamp, plate, holding rod or other device, be sure to preheat the device first. This will avoid many failures.

While preheating, it usually is best to hold the cone of the flame about 1

to 1½ in. from the metal so as to heat slowly. As the temperature of the work is increased by the preheating operation, hold the brazing rod close to the work and let the flame melt it so that it will flow on the work. When the work is hot enough to melt the small globules of brazing alloy which fall on it, the work is at a proper temperature for brazing. Then, as rapidly as possible, the brazing alloy is applied until it flows freely throughout the joint. Often, when separate pieces are being brazed together, one side of the joint is "tinned" before the parts are assembled for making the final joint.

When two parts are to be joined by brazing and a fixture is not used, set up one piece in a vise or on a suitable preheated plate, apply the flux, then preheat and tin with the brazing rod. Then flux the second piece, position it on top of the first piece and heat it with the torch while keeping the first piece hot. After the second piece starts to settle, press down with a preheated rod to insure a good joint. Always apply flux before preheating, or the surfaces will oxidize and a poor braze will result. It is necessary to make sure that the flux gets all of the way through the joint to be brazed.

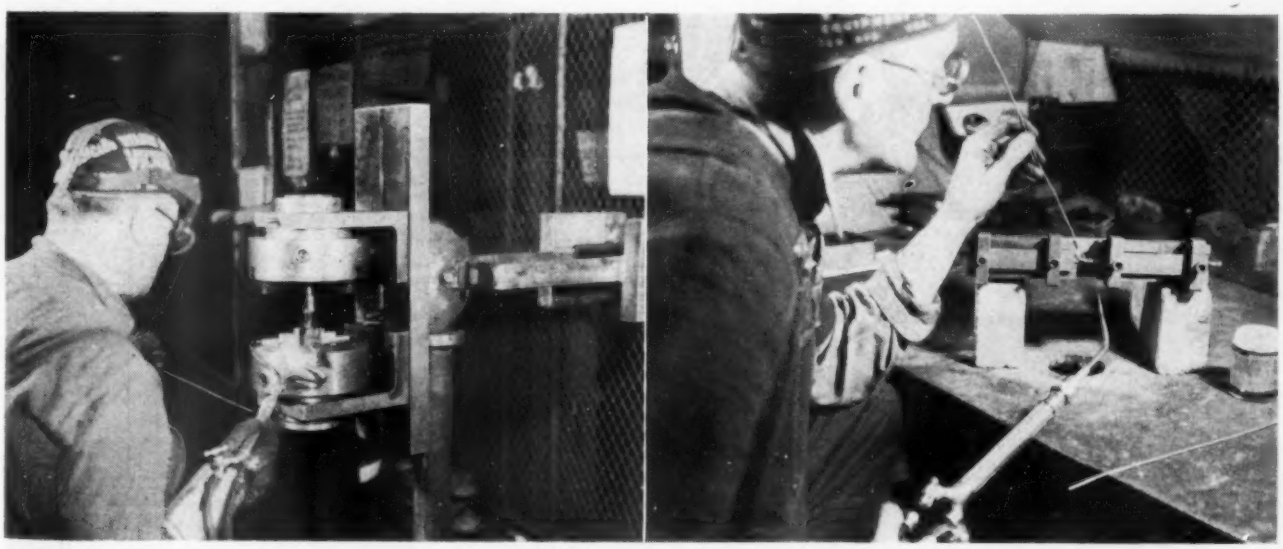
When brazing a cracked cutter, completely braze on one side, then turn the cutter over and repeat the operation during the same heat. In such cases, both sides are coated heavily with flux before starting the operation and it is not necessary to flux the second side when the cutter is turned over. Always direct the flame on the brazing rod as much as possible to avoid overheating the tool. Use the brazing rod as an indicator of the proper and safe heat. During these brazing operations, the end of the brazing rod is dipped into the flux.

Milling cutters can be made from heat-treated machine steel bodies fitted with hardened tool-steel blades. Each joint is brazed carefully so as not to draw the temper of the hardened blades

While it is important to have complete penetration by the brazing material on the surfaces to be joined, it is equally important to keep the brazed joint as thin as possible in order to obtain a high tensile strength. The strongest joint thickness seems to be about 0.0015 in.

Variations in the method of applying heat are necessary to keep the joint thin. When ends are to be joined, the pieces should be placed in a vertical position, using an alignment fixture. The lower piece is clamped solidly, while the upper piece is held in position with spring plungers. The weight of the upper piece will serve to thin the joint when the brazing material starts to flow.

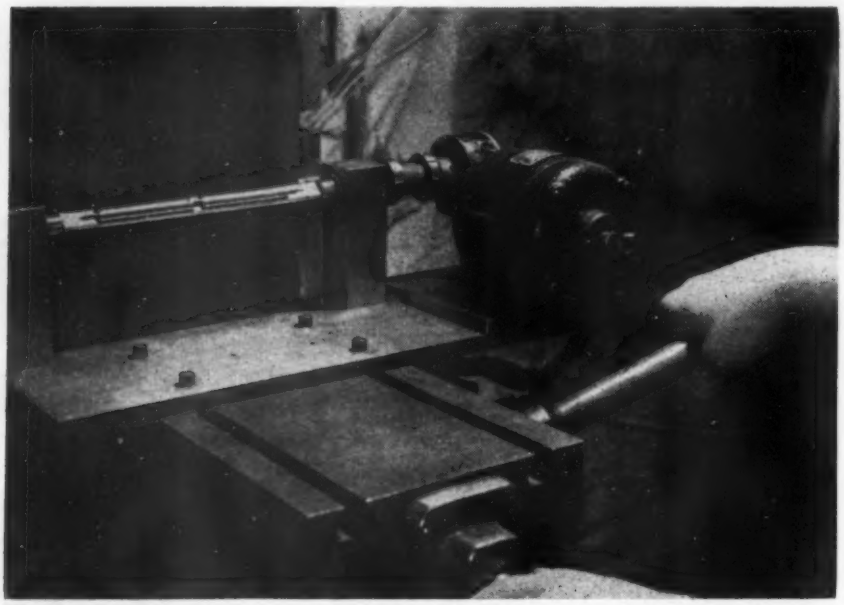
An outstanding phase of the use of low-temperature brazing is that of making new tools from both scrap materials and new materials. We have made mill type and back-off type plain, side and form milling cutters by brazing hardened, prefabricated blades into a heat-treated machine steel body slotted to receive the blades.



A fixture consisting of two universal chucks, mounted on adjustable angle plates, is used for brazing round sections together. Sections of a broken drill are aligned in a box fixture for salvaging by low-temperature brazing

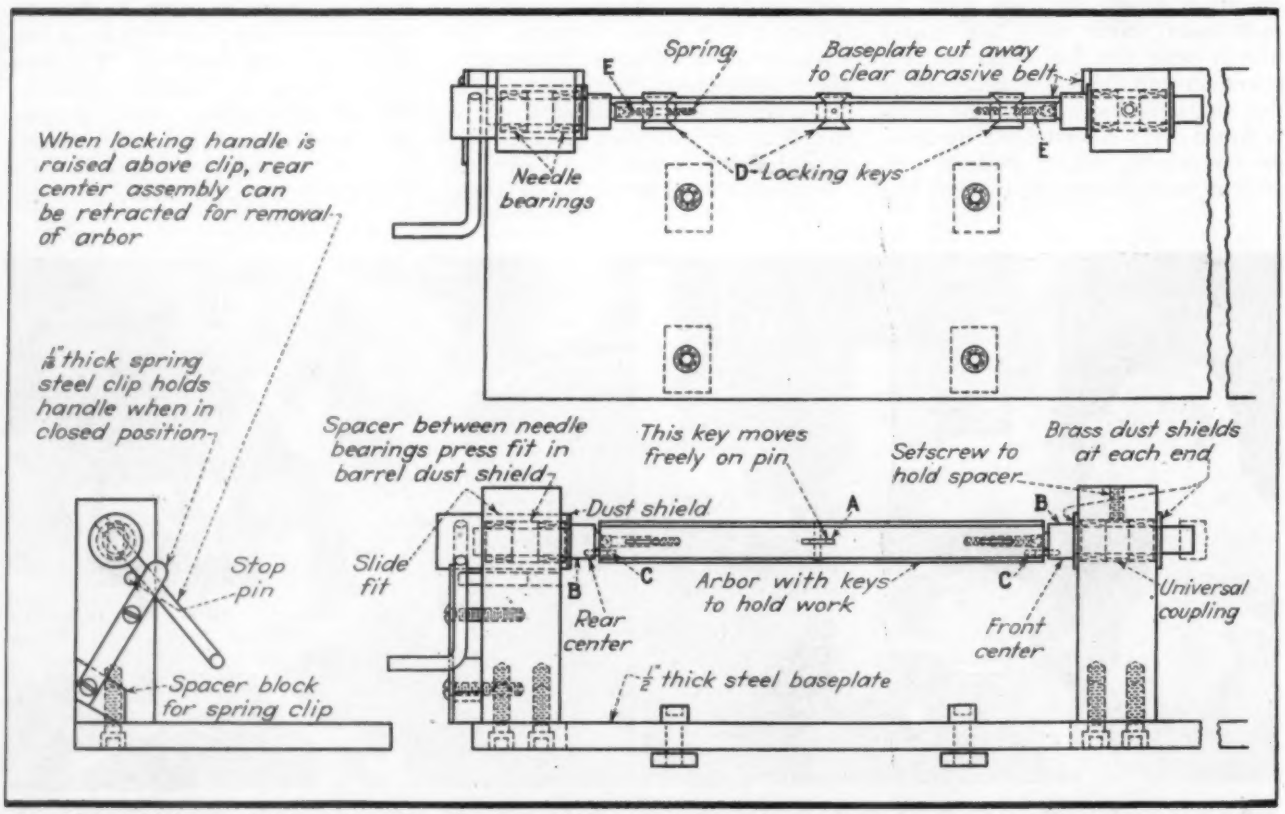
Cylindrical Grinding With a Flat Belt

BY E. A. HEPNER, VICE PRESIDENT, AND H. J. MOSKOW, GENERAL MANAGER,
CONSOLIDATED RADIO PRODUCTS COMPANY

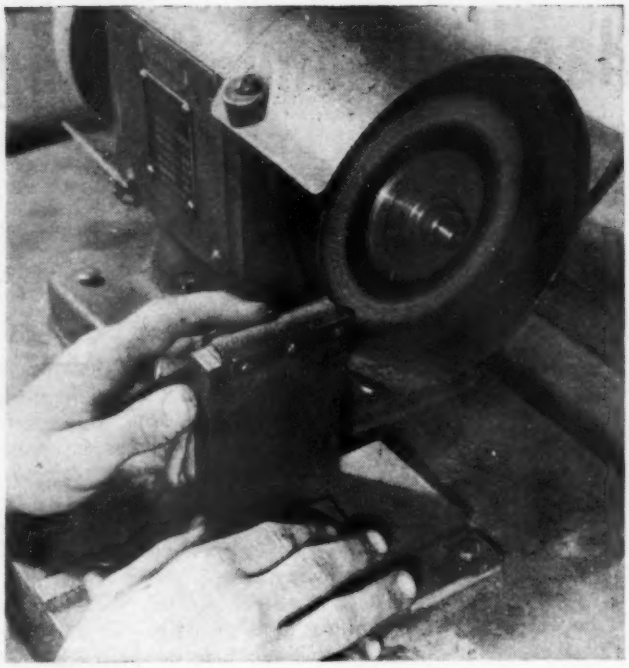


Four cast Alnico sticks are cylindrically ground at the same time in this set-up. The motor driving the work arbor normally is enclosed in a dust-proof housing

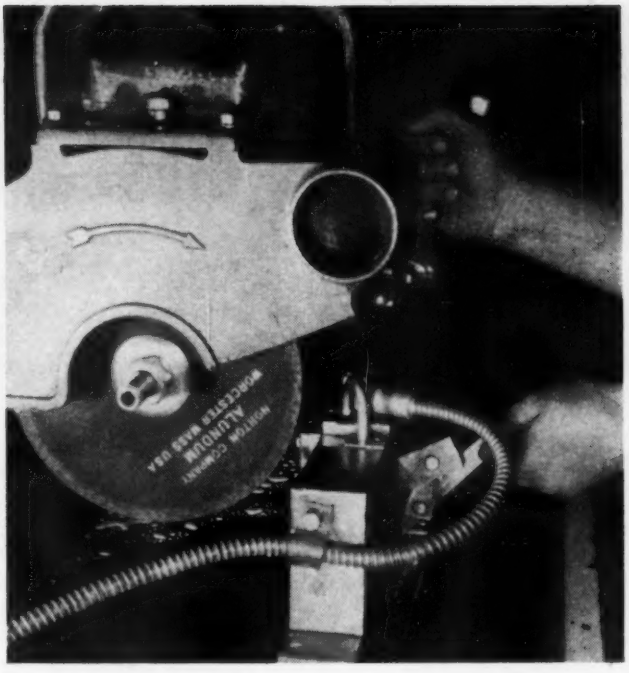
DEVELOPMENT of a special work-holding fixture has made it possible to use a belt grinder for finishing cylindrical surfaces on cast Alnico "sticks" which later are cut into short lengths to make magnet pieces for a product used by the Signal Corps. This fixture is mounted on the table of the Porter-Cable Type G-8 "Wet-Dry" grinder in such a way that feeding the table toward the machine brings rotating arbor *A* against the moving abrasive belt. The arbor is supported on centers *B* which rotate in needle bearings. Each of these centers has a pin *C* which fits into a hole in the end of the arbor beside the center hole. These pins insure that the centers will rotate in the needle bearings, and provide a means for insuring rotation of the work-holding arbor by the 1/20-hp. Bodine motor incorporated in the fixture. This motor drives through a reduction gear to provide an arbor speed of 30 r.p.m.



The Alnico sticks are held on the arbor by keys which are tightened by setscrews at each end of the arbor. Live centers, running in needle scorings, support the arbor



Both ends of the 3-in. long cast Alnico sticks are notched at this grinder to provide clearance for the tapered wedges which hold the sticks on the arbor of the cylindrical grinding fixture



A Walker-Turner radial saw fitted with an abrasive cut-off wheel is employed for cutting 5/32 in. thick magnet pieces from the Alnico sticks. The abrasive disk is rotated at 3450 r.p.m. by a 1-hp. motor on the wheel spindle

The Alnico sticks are approximately 9/16 in. wide, 7/32 to ¼ in. thick and are purchased in 6 in. lengths. They are flat on one side, while the other side is cast to approximately the radius which is finish ground in the fixture. These sticks are cut-off to 3 in. lengths, each end of each is notched with an abrasive wheel to fit locking keys *D* mounted in the arbor of the cylindrical grinding fixture. Four of the cast sticks are mounted on the arbor, two on each side. Setscrew *E* in each end of the arbor tightens the keys which hold the sticks in place. Several arbors are provided, in order that arbor loading operations can be performed at a bench while an arbor is in the fixture for grinding a lot of four sticks.

Approximately 0.015 to 0.020 in. of stock is removed from the cylindrical side of each of the sticks as it is being ground. The finished diameter of the work while on the arbor is approximately 11/16 in. This diameter now is held within plus or minus 0.002 in., but it could be held within closer limits if necessary. The fixture and work are fed directly in against the 8-in. wide abrasive belt, and are not oscillated longitudinally during the grinding operation. A 120-grit aluminum-oxide coated abrasive belt furnished by the Minnesota Mining and Manufacturing Company has given best results for all of the grades of Alnico ground to date on this fixture. A soluble oil coolant is flooded over the abrasive belt and work during the grinding operation.

A very simple setup has been found satisfactory for notching the ends of the 3-in. long sticks before mounting them on the arbors for the cylindrical grinding operation. A Diehl ¼ hp., 3450 r.p.m. bench grinder is used for this notching operation. Norton Alundum rubber-bond abrasive cut-off wheels 1/16 in. thick are used for grinding the notches. The cast Alnico sticks are guided in a simple fixture to insure that the notches are ground in the center of each end. This fixture consists of a steel blade mounted vertically on a plate which can be positioned properly in front of the wheel and then locked by clamp. At the top of the vertical blade are guide strips which hold the "stick" at right angles with the grinder spindle and central with the abrasive wheel. Another stop plate, fitted at the inner end of the blade and notched to provide clearance for the wheel, controls the depth to which the notches are cut. No coolant is used during this notching operation.

Abrasive Sticks Cut in Fixtures

A Walker-Turner radial saw fitted with a Norton Alundum rubber-bond abrasive cut-off wheel is employed both for cutting the cast Alnico sticks into 3-in. lengths for the cylindrical grinding operation, and then for cutting these lengths into the shorter sections which become the magnet pieces. For these operations, the abrasive wheels are 12-in. in diameter when purchased. When these wheels have been worn down to about 5 in. diameter, they are removed from this machine and used on the Diehl bench grinder for notching the ends of the 3-in. abrasive sticks as described above.

An interesting fixture has been developed for the cut-off operation on the Walker-Turner machine. Experiments showed that it was necessary to clamp the work on each side of the abrasive cut-off wheel, and to guide the wheel between tungsten-carbide blocks to keep it from weaving in the cut as it is fed across the work by hand. These carbide blocks are set up close to the wheel, and the wheel cuts its own clearance during the first two or three cut-off operations. The clamping jaws on the fixture are operated by a quick-acting, hand-operated lever. During the sawing operation, soluble-oil coolant is flooded over the work and the rotating abrasive disk. At first, the work pieces were positioned in the fixture with the flat sides down. It was noted, however, that the thin section at the end of the saw cut would break out if extreme care was not used in feeding the saw slowly as the cut was being completed. This difficulty has been overcome by arranging the fixture to hold the work with the radius side down.

Modern Methods of Handling and Storing Dies and Fixtures

BY BEN C. BROSHEER, ASSOCIATE EDITOR, AMERICAN MACHINIST

STORAGE OF PUNCH PRESS and forging dies, die casting and plastic molds, jigs and fixtures, and the movement of such tools from the storage area to the machine and back again, differs considerably from storing standard cutting tools and similar equipment in the average tool crib. Dies, molds and fixtures vary greatly in size and weight, difficulty of handling, frequency of use, and the care which must be employed in moving and storing them. They range in size from the light, simple drill jigs to huge body dies employed, in normal times, in automobile plants.

Ordinarily such tools are used for one specific part, and the frequency of their use depends upon the quantity of such parts to be made in a given length of time. Proper storage involves the selection of a specific location in the storage area for each tool, and a card file or other record showing the storage location of each tool so that it can be found quickly when needed. Tools that are used most frequently should be placed in handy locations. Where the tools are of such size or weight that mechanical handling is necessary, adequate facilities must be provided. Usually storage areas for such tools are provided in or near the department where they are used, unless their use is so infrequent that their transfer to a central storage area is less expensive than the maintenance of a departmental storage area.

The accompanying illustrations show modern methods of storing and moving jigs, fixtures, molds and dies. There is no definite rule to follow in handling tools of a like size and type in individual plants. Methods and equipment for each installation must be chosen after a careful study of all factors involved. Because of wide variations in shop conditions, a procedure which works well in one shop may be entirely unfitted in another shop, even though it may be making the same product.

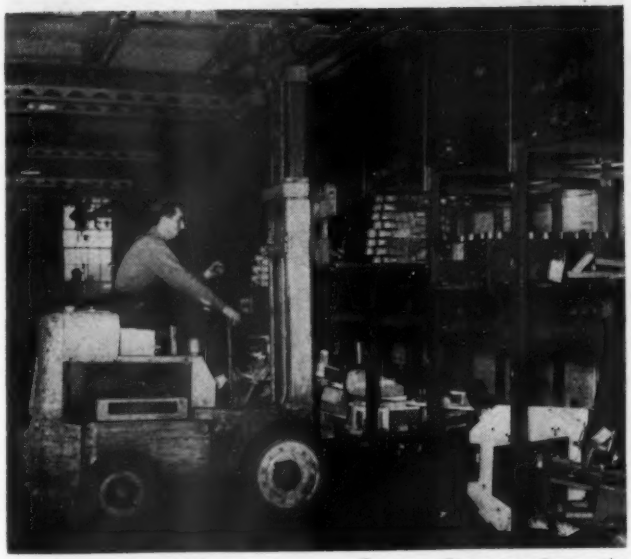
Mechanical handling methods usually cannot be justified when the tools are relatively small and can be carried about the shop easily by hand. Storage of such tools usually is best solved by using properly selected steel or wood shelving like that shown in Fig. 1. Here, all of the tools required for a given machine are stored in adjacent shelf areas so that they can be located quickly when needed. Unless ladders are provided, the top shelf should never be more than 6 ft. above the floor. However, with an arrangement such as illustrated, the shelves may be extended to any reasonable height.

When the tools are too large to be lifted by one man, mechanical handling methods are essential. If the number of such tools stored in one tool crib is not large, and sufficient area is available within the crib, perhaps the least expensive method of storing and handling large tools is on skid platforms. Standard hand-operated lift trucks are used in moving the loaded skids between the storage area and the machine on which the tool is to be used. Smaller tools are placed in steel shelves and cabinets placed around the wall of the crib. Where such a setup is possible, it usually is desirable to keep all special tools required on the same skid with the jig or fixture.

If floor space is limited, some vertical means for storing large tools is

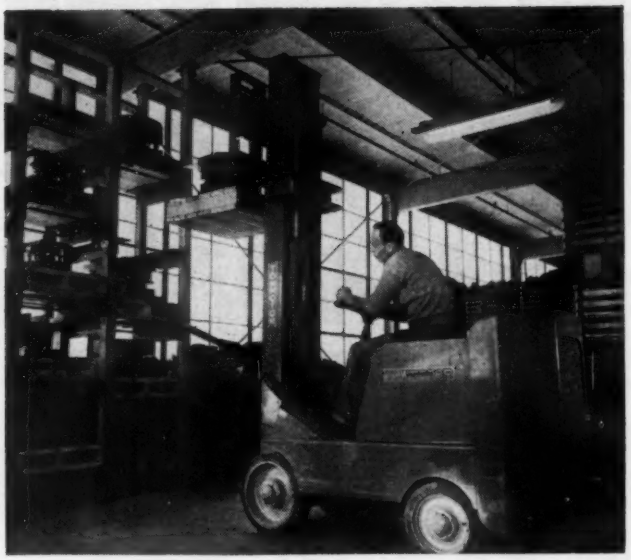
Courtesy Package Manufacturing Company

Fig. 1—Small jigs and fixtures, which can be handled by one man, usually are stored on shelves in this tool crib. Use of the ladder simplifies storage problems by giving easy access to upper shelves



Courtesy Towmotor Corporation

Fig. 2—When floor space is at a premium, steel racks can be built to hold lift-truck skids on two or more levels. Note that a series of small shelves has been built on top of this skid for storing small tools



Courtesy Greenlee Bros. and Company

Fig. 3—Wood racks for holding skids or pallets loaded with tools or dies, have been made necessary by the war. The wood pallets shown are faced with steel to facilitate moving dies to and from press beds

necessary. An example of such an arrangement is shown in Fig. 2. Here storage racks have been made from steel angle-iron sections; the size of each rack section being just large enough to accommodate the standard lift truck skid platform. This rack, installed in the plant of Greenlee Brothers and Company, is located in the machine shop and is used for storing skid loads of parts as well as for storing the jigs and fixtures employed when machining these parts. It should be noted that a second tier of steel shelving is suported above the main rack frame. A ladder at one end of the rack provides access to a platform in front of this second group of smaller shelves. On these shelves are stored the smaller jigs and fixtures, which are light in weight and can be transported by hand.

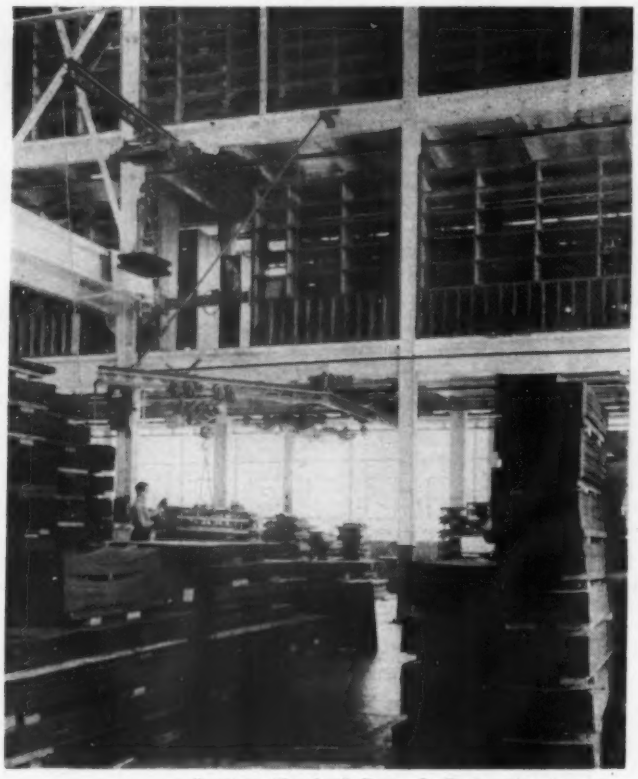
The successful adaptation of wood to the construction of a similar rack in the plant of the Bendix-Westinghouse Automotive Air Brake Company is illustrated in Fig. 3. Here, 30 in. square double-faced wood pallets are used for storing large punch press dies. A Towmotor power lift truck lifts the loaded pallets into the various storage sections of the rack, and transports the loaded pallets to and from the punch presses. The top of each pallet is faced with ¼ in. hot-rolled steel boiler plate. These smooth steel plates are kept slightly lubricated to facilitate moving dies to and from the press beds.

An interesting storage rack for forging dies has an arrangement of stepped shelves. It is built around three sides of the die storage area in the plant of the Fairmount Tool and Forging Company. It was designed especially for handling heavy forging dies with a hand-propelled Cleveland Tramrail crane and electric chain hoist. Such an arrangement of stepped shelves for storing tools and dies has a number of obvious advantages. Dies stored on these racks are easily located as none of them are hidden back of or under other tools. Each position is numbered to correspond with the tool location record in the die storage department office. Dies are easily lifted on or off shelves without having to move them out from under other shelves before lifting them vertically. Finally, adequate lighting is easily provided. The principal disadvantage is that somewhat more area is necessary than would be required if shelves were placed directly above each other, but this would have made a somewhat more complicated handling method necessary and required additional types of handling equipment.

At the Canadian - Westinghouse Company, dies for punch press work are stored on three gallery floors, located across one end of the punch shop. Very light dies are kept on the top gallery, medium sized dies on the middle gallery and the very heavy dies are stored on the ground floor. On the two upper galleries suitable shelving is provided to accommodate average size dies.

The dies on the top floor require no mechanical means of handling. Dies stored on the middle gallery are of considerable weight, and mechanical handling equipment must be used. Shelves are placed parallel to the gallery, with uniformly spaced aisles between the rows of shelving. Shelves are lined with light-gage sheet steel, so dies may be moved by hand without difficulty. A portable bridge, made of a roller conveyor section, fits across the aisle from one set of shelves to the other, as shown in Fig. 5. This bridge is placed opposite the compartment in which the required die is stored, and the die is pulled by hand onto this bridge. The die is lifted by an electric hoist suspended from a hand-propelled carrier on a Cleveland Tramrail transfer bridge. This hoist can be taken to any aisle for lifting a die off the roller conveyor bridge and carrying it to the center of the gallery floor. Here the two transfer bridges serving the floor interlock with a jib crane that extends out from the gallery. The carrier can be run out on this jib and the die lowered to the ground floor, where a truck is used to move it to its destination.

On the ground floor, large round dies are stored on their edge in pockets. Large rectangular or irregular shaped dies are stacked one above the other to a height of about 5 ft. These dies are of considerable weight. On this floor there are two runways, on each of which is a Cleveland Tramrail transfer bridge for conveying the dies to the center of the floor. At this point the cranes in both aisles can be locked together in line, so that the trolley of the inside crane may be run across the outer crane and onto a jib crane serving the main shop floor. Here the die may be placed on a truck or lifted by

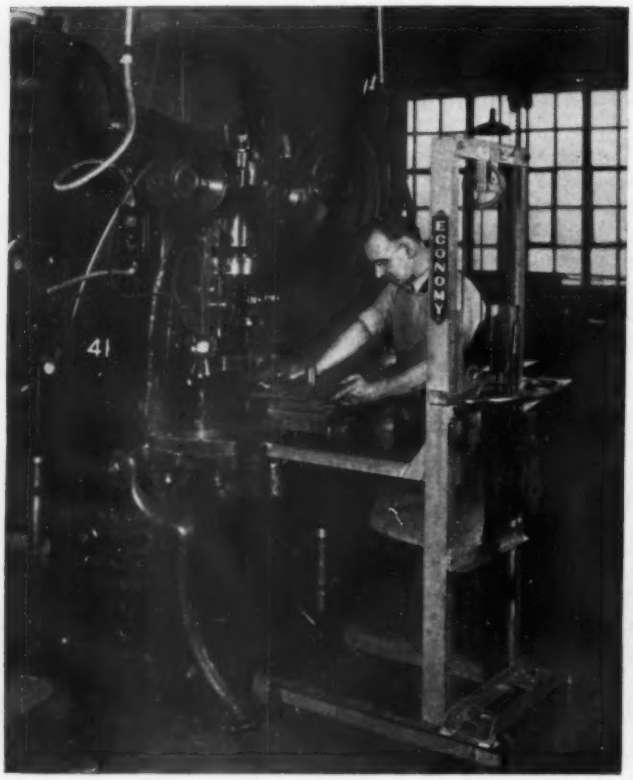


Courtesy Cleveland Crane & Engineering Company

Fig. 4—At this plant dies are stored in shelved bins on three gallery floors. Light dies, stored on the top floor, are moved by hand. Cleveland tramrail transfer bridges serve the two lower storage areas

Courtesy Cleveland Crane & Engineering Company

Fig. 5—This roller conveyor bridge spans the aisle space between opposite die storage shelves to facilitate moving a die into or out of its bin. The bridge crane delivers dies to trucks for movement to punch presses

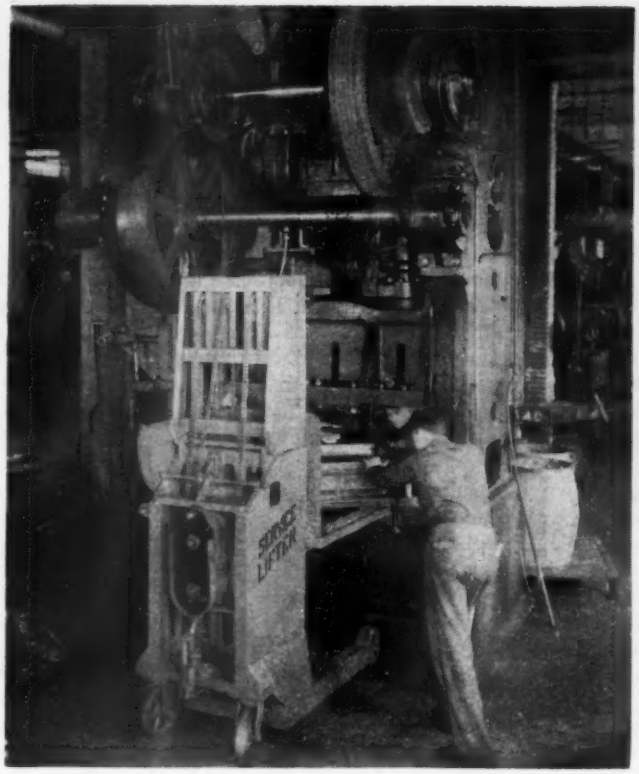


Courtesy Economy Engineering Company

Fig. 6—Portable lifters can be employed in most shops for transferring medium size dies between racks and punch presses

Courtesy Economy Engineering Company

Fig. 7—Heavy-duty portable lifters can be equipped with die pulling winches to aid in moving large dies on and off the platform



Courtesy Economy Engineering Company

Fig. 8—This large portable lifter has a roller platform to make it easier to transfer heavy dies to or from presses and storage racks. It also has a die pulling winch

Courtesy Service Caster and Truck Company of New England

Fig. 9—When the die storage racks have rails on which the tools rest, pallet lifters or power lift trucks equipped for handling pallets can be used

one of the main overhead traveling cranes which serve the punch presses.

There is only one trolley for the two cranes which serve the storage area on the ground floor. Crane and hoist equipment on the second floor gallery is of 1-ton capacity, while the equipment for the first floor storage area is of 3-tons capacity. Since areas covered by the swinging jib cranes overlap, loads may be easily transferred from the first floor to the mezzanine or vice versa. The bridges and carriers are hand propelled. The electric hoists on these cranes are operated by push-buttons.

Portable lifters of both hand-operated and power-operated types are especially suited for transferring punch press dies between storage areas and machines, particularly when the storage area is located near the punch presses. Power lift trucks like those shown in Figs. 2 and 3 are better suited for this work when heavy dies must be transferred long distances. Hand propelled lifters are economical when distances are relatively short and the dies are not too heavy.

As shown in Fig. 6, the platform of the portable lifter can be brought level with the bed of the punch press and the die setter has only to push the die from the lifter to the press. He is not required to do any heavy lifting. When portable lifters are used small and medium sized dies can be stored on steel or wood shelves in racks placed in convenient locations in the punch press department, or in a tool crib adjacent to that department. When the steel platform of the lifter and the steel faced shelves are kept slightly lubricated, the dies can be moved onto or off of the lifter by one man.

A major advantage of small portable lifters is that they can be maneuvered into tight corners and narrow aisles. Even those made with high platform lift capacity generally can be used on several floors of a multistory building, since they can be collapsed to enter elevator doors. At the East Pittsburgh works of the Westinghouse Electric & Manufacturing Company, one man and one of these lifters handle all tools from the crib to the punch presses or other machine tools on two floors of a building. All dies for the punch presses on the third floor are stored in a crib on the fourth floor and are carried up and down on the elevating platform truck.

Lifters used to handle dies and other tools in punch press departments have capacities ranging up to about 5,000 lb. Usually these are equipped with smooth steel plate decks to facilitate sliding dies onto the platform. Where heavy dies must be moved, die pulling winches, like that shown in Fig. 7, can be built into the lifter for moving the dies on or off the deck plate. Some lifters have platforms equipped with rollers that further facilitate moving large dies. Such a unit is shown in Fig. 8. This lifter has 10 in. diameter wheels to facilitate movement across the shop floor, and is equipped with a die pulling winch as well as a roller platform. Where dies are stored on skids, the roller platform is removed and the skids themselves are lifted by this unit. By means of a snatch block connected to the back of the press or the back of the die rack, dies can be pulled off the platform with the die pulling winch as easily as they can be moved onto the platform when the winch is used in the customary manner.

Where dies or other large tools are stored on steel racks with supporting rails rather than flat shelf plates, either portable lifters or power lift trucks with pallet arms can be used for picking up the die unit from the rack. An advantage of this method is that the tool does not have to be pulled onto the lifter platform or pushed off the platform onto the shelf by hand or by connecting the winch cable to the tool. Such racks can be made up of steel sections, as shown, or can be made of wood, with rails properly positioned to support the tools or pallets.

Putting Quality Into Quantity

BY L. T. RADER, INDUSTRIAL CONTROL ENGINEERING DIVISION, GENERAL ELECTRIC COMPANY

Quality Control, based on rules of probability, enables plants to determine in advance number of satisfactory parts produced

A SYSTEM of mass production with its phenomenal output and low costs depends in part for its success on two fundamental principles:

1. The manufacture of parts in large quantities with consequent low cost per individual piece.
2. The complete uniformity and interchangeability of those parts.

Automatic machinery such as screw machines, punch presses and multi-cavity molding machines are turning out pieces at rates undreamed of just a few years ago. Because of this, if anything goes wrong during the course of manufacture, large numbers of defective parts may be completed before they are detected. The schedules of whole factories are based on the output of their machines. The cost of remaking the parts may not be large, but the disruption to the schedule with resultant losses may be considerable. It was, therefore, almost inevitable that a system should be developed for the control of quality which would be suited primarily to our mass production system.

Such a system is known as Quality Control. Although it was pioneered in this country by the Bell Telephone System as long as twenty years ago, it is still in its infancy. The great impetus to the method came in 1940 when the War Department, realizing the value of standard methods of Quality Control, requested the American Standards Association to set up temporary standards for the control of materials and manufactured products.

What is Quality Control? Technically, it is the application of the laws of probability to measurement. Actually, it is a method of *controlling the quality of manufactured pieces during the course of manufacture*. In its simplest form, Quality Control consists of taking measurements on pieces during production and imediately deciding whether the machine on which the pieces are being made should be allowed to continue making them. Instead of making 1000 pieces all 0.001 in. over the maximum tolerance, and then wondering if they can be used, or often using them to save money or meet schedules to the detriment of the finished product, the pieces under this system would never have been made.

Quality Control is the control of quality in a manufactured article—but every manufacturer has a method or set-up to do that, and does not necessarily practice Quality Control. The term refers to the procedure of taking the right data at the right time. These data are arranged by charting or other simple method to show whether quality of the manufactured article is uniform. As a yardstick of uniformity, "control limits" are set up. If the quality at some time is not within these limits, or shows an unsatisfactory trend, definite action is immediately taken to correct the condition.

There are many difficulties and troubles with which a factory management has to contend — dies which wear; bearings that get loose; stock which is undersize, oversize, or dirty; loose fixtures; careless, tired, or untrained employees. For these reasons, it would seem that there is no mathematical method which takes into account all these factors. However, there is a kind of mathematics which is applicable in just such conditions, and that is the mathematics of probability. Although statisticians have worked out the equations governing the theory, the basis of the equations rests on two laws which are experimental and almost obvious. Speaking of them in reference to the output of a screw machine which turns out a piece of a certain nominal diameter, these two laws state that if there is not consistent error in operation—

(a) The machine will turn out as many parts which are oversize as are undersize;

(b) Small errors are more likely to occur than large errors; that is, most of the pieces will be close to the average value and only a few will be very far out.

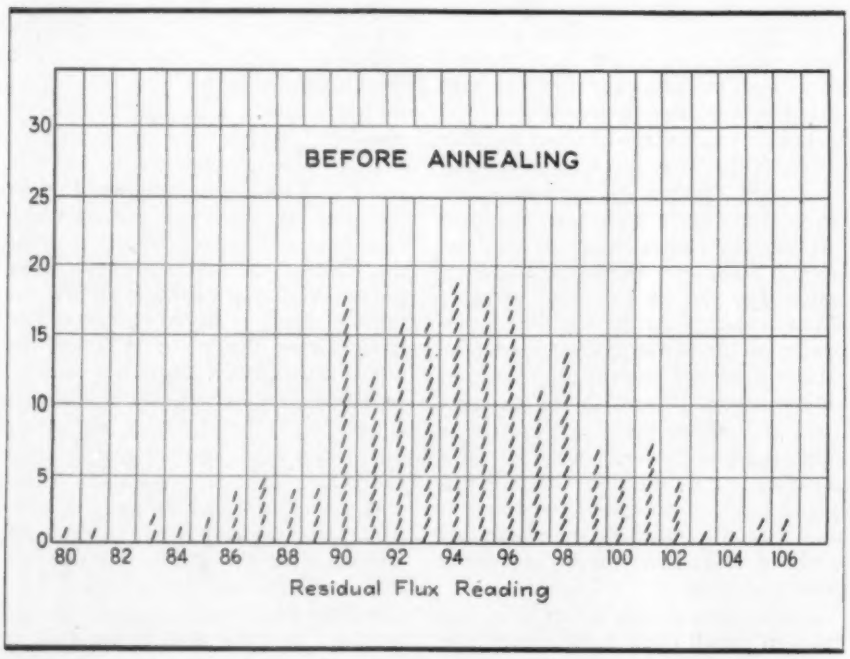


Fig. 1—In taking Quality Control data for checking magnetic residual flux in relay parts, the operator merely records a line in the column corresponding to the value read on a meter. As is usually found, most of the points fall near the center of the chart and taper off in number to the ends

Based on these two observable facts which have been verified by means of a large number of observations, an equation has been worked out which is the basic equation of probability and from which the valuable conclusions can be drawn which form the basis for this kind of control.

The probability curve on which Quality Control is based separates the causes of all variations or errors into two main classes.

1. Random causes. These are due to pure chance alone and, therefore, obey the two laws stated above.

2. Asignable causes. If on taking data on the dimensions involved, it is found that the dimensions is more often over-size than undersize or shifts from time to time, the theory says that there is an assignable error in the process. It may be one or more of a number of causes such as a worn tool or a loose fixture.

The method has an important application in evaluating the accuracy of any machine tool. With the machine set up to do a certain job, a number of pieces are turned out. These are all measured and the results plotted in terms of the difference between the actual dimension and the nominal dimension. From this data the precision of the machine can be definitely evaluated so that the percentage of its output falling between any two dimensions can be estimated.

For example, a die was made to form a U-shaped bronze spring which carried a contact tip on one end and a threaded stud on the other. The only dimension in which the designer was interested was the distance between the contact tip and the stud carrying a tolerance of ±.010 in. The first 25 pieces made were measured. From the data obtained it was possible to say immediately that only 65 percent of all pieces turned out by that die would fall within the required tolerances, but if the tolerances were increased to ±.020 in., around 90 percent would pass. It was, therefore, immediately possible to make a decision regarding the design to overcome the trouble.

By taking such data on all its machines, the factory can evaluate each machine in terms of its true output accuracy. Such an evaluation can be made periodically of each machine. This figure of merit will aid in scheduling jobs through the machine shop depending on the tolerances demanded.

In the overall view, the inspection department is the focal point of the whole system. Instead of random inspection, a carefully laid out schedule of sampling must be followed. Measurements must be made of the dimensions involved, and recorded. This does not necessarily mean more paper work, but may consist merely of a dot or a cross on a chart. As long as the average point falls between certain predetermined control lines, the operation is allowed to continue. If, however, a point falls outside the lines, or if successive points show a drift in any one direction, action must be immediately taken to find the reason and correct it, or stop the machine or process before defective parts are made. This does not make the inspector responsible for good work; that is and always should be, strictly the factory's responsibility.

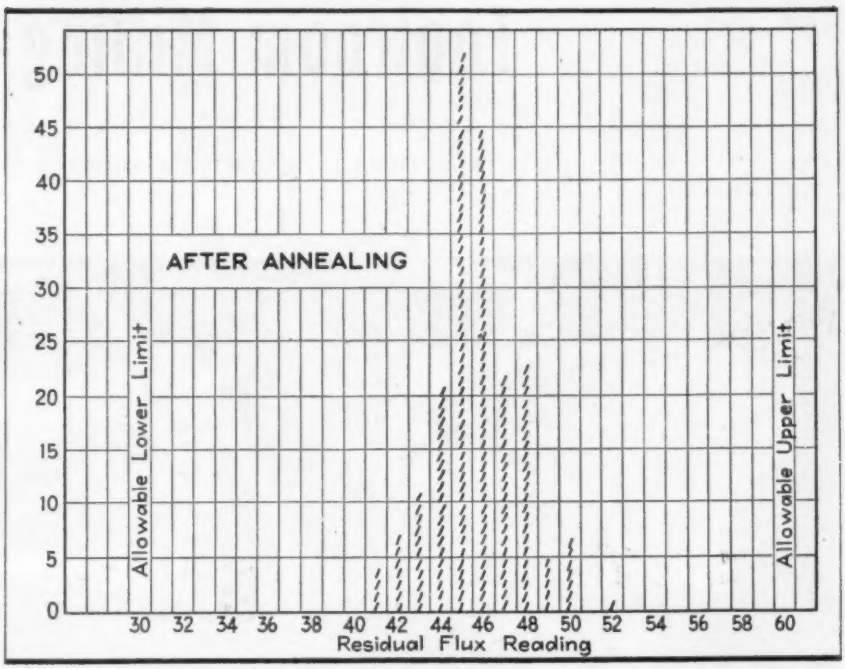


Fig. 2—Data taken on the same parts as in Fig. 1, after annealing, show that the anneal reduced the average residual value considerably and reduced the range of values. Data gathered on a percentage of parts going through the factory shows variations in raw materials or in the effect of processing to help control final quality

Need Working Knowledge Only

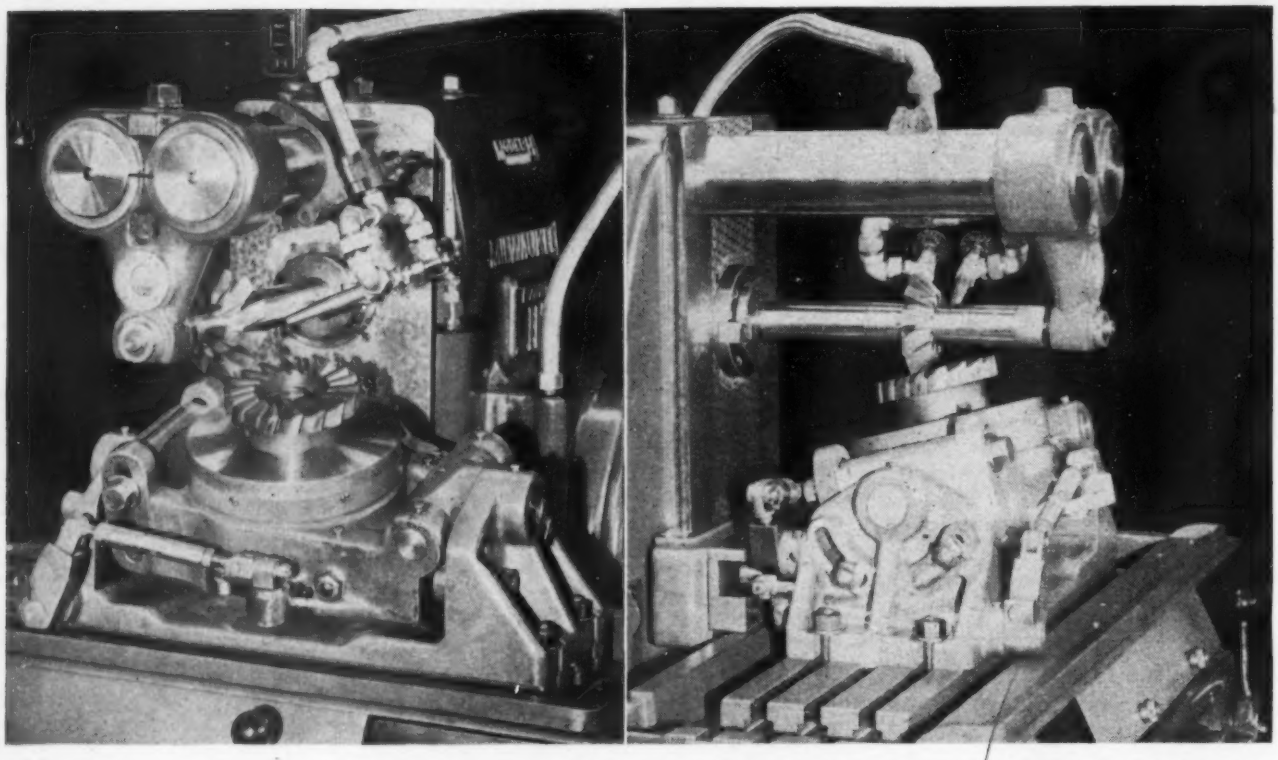
To carry out this kind of inspection does not require more time or personnel than the usual present-day inspection methods. In fact, it has been stated that no case is known where inspection costs have been increased as a result of introducing a quality control system. The frequency and kind of sampling to be followed depends in part on the kind of process to be checked. No all-inclusive rules can or need be laid down. Factory engineers and inspectors need only a working knowledge of the rules for the application, but need no knowledge of the statistical background. That can be left to the quality control specialist. This specialist usually is a production engineer or a planning department man preferably independent of the factory foreman. It is his duty to set up the control lines. He must take the initial data required, and if necessary consult the engineers and factory on the allowable limits during manufacture.

This method of taking data and immediately recording it on charts is nothing but a continuous indication of performance. It does not automatically make good parts, but it does stop the manufacture of bad ones. Inspection and complete checking after a complete lot is manufactured is not Quality Control. True enough it prevents a defective assembly from being shipped to a customer, but the defective assembly should never have been built.

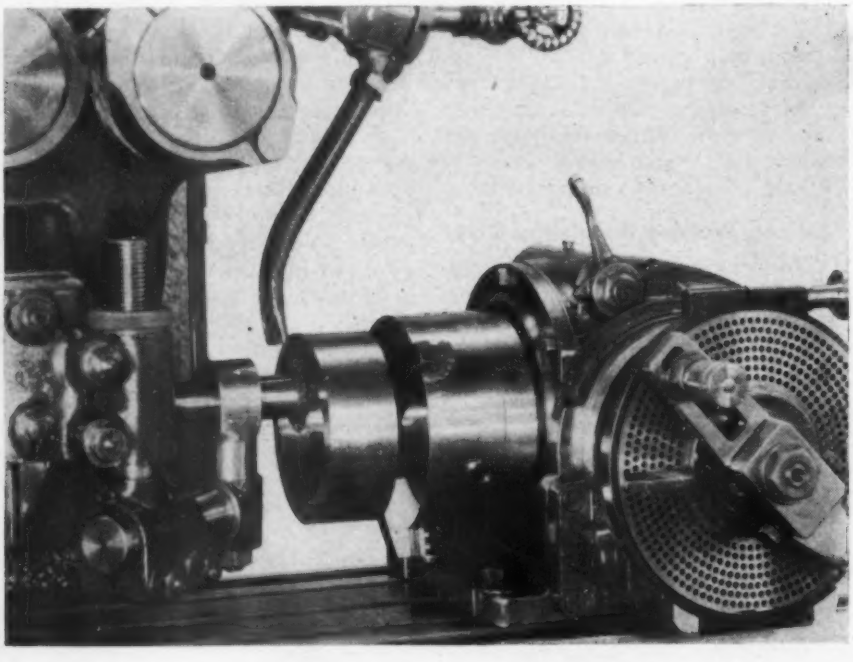
Quality control methods can be introduced gradually into a factory with no radical departures from standard methods. It is essentially suited to mass production, but can pay dividends even on less than a day's run on a lathe, drill press, or other machine tool. In these days of great factory responsibility to the war program, this method seems to offer advantages which factory supervisors would do well to consider.

Toolroom Milling—IV

BY H. A. FROMMELT, KEARNEY & TRECKER CORPORATION

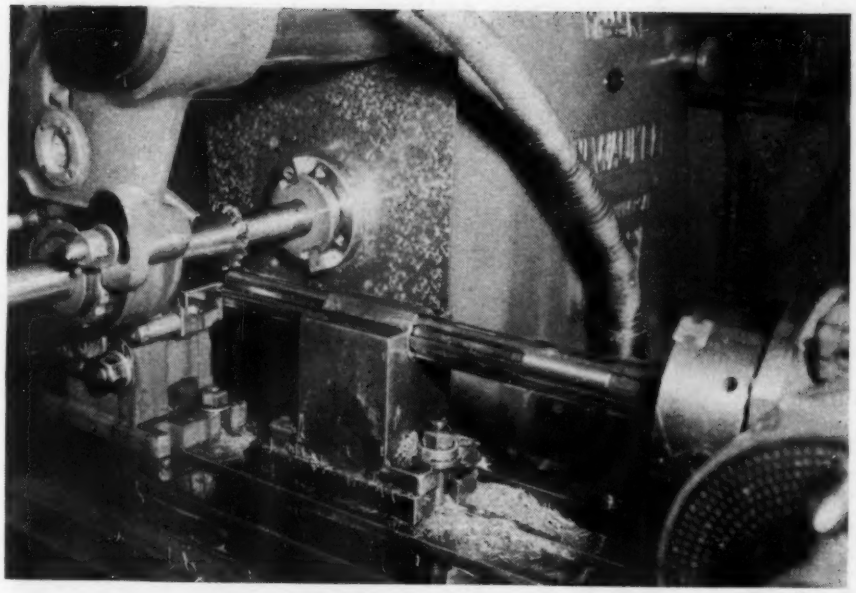


Side milling cutters are milled with this set-up. This cutter has 18 teeth with rake and helix angles of 20 and 12 deg., respectively. The tilting fixture shown was designed especially for this job and is mounted on a No. 2 horizontal milling machine. The fixture is so designed that its body can be tilted in two planes by swinging through arced slots. A 4½ in. form cutter was revolved at 50 r.p.m., giving a surface speed of approximately 60 ft. per min. for the high-speed steel. The feed rate was 3 in. per minute

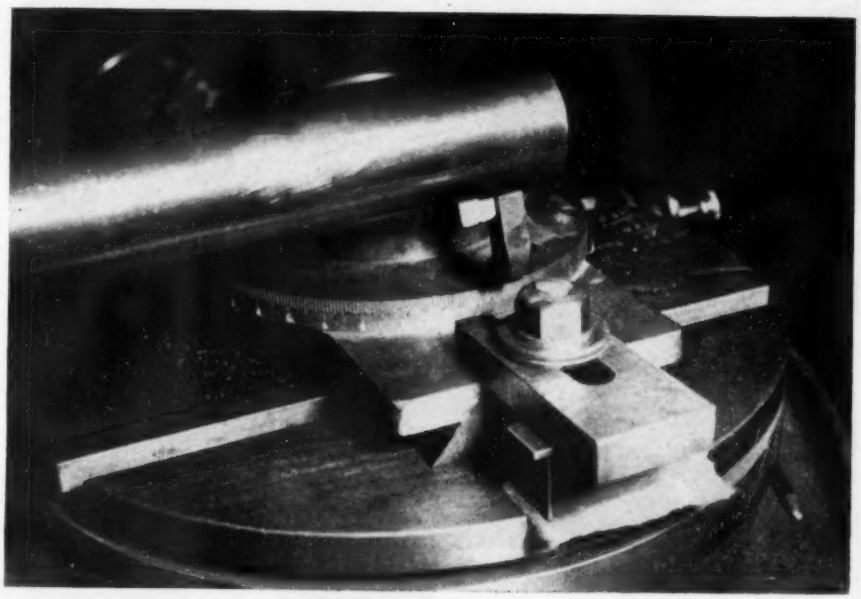


Internal threads can be milled as shown on a universal milling machine equipped with a thread milling attachment, arbor support, dividing head and a chuck. The V-thread form cutter is used here to mill eight-pitch threads on the 5½ in. internal diameter. The length of the threads is 1 in. For the required lead of 0.125 in., the following gears were interposed between the dividing head and the table screw: Position A or the dividing head shaft, 36 teeth; position B or inner stud, 20 teeth; position C or outer stud, 20 teeth; position D or hand directional lever, 24 teeth; position F or upper shaft, a one-tooth worm; position G or the table screw, a 96-tooth worm-wheel. A 25-tooth gear could have been used at C and a 36-tooth gear at D for the same lead. The cutter speed was 100 r.p.m., while the feed rate was set at ½ in. on the circumference.

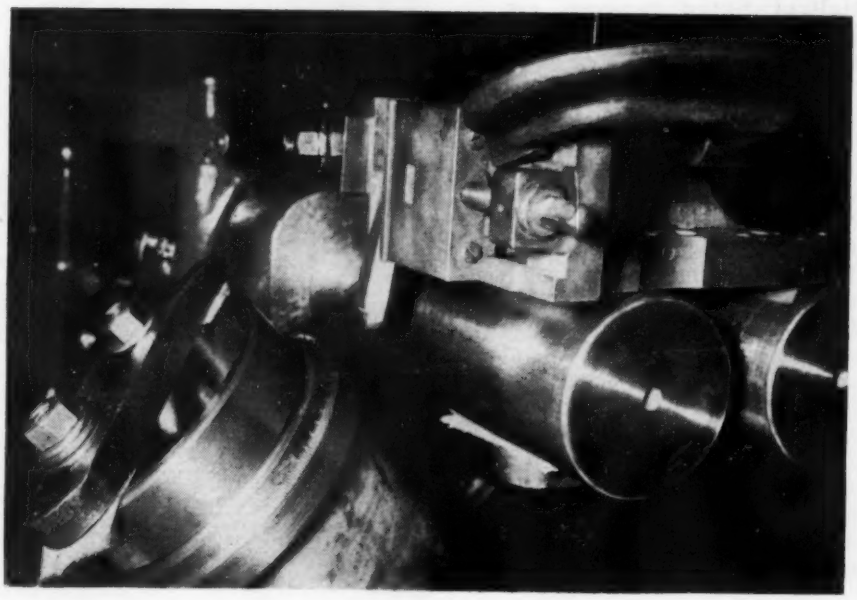
Spline milling customary involves close tolerances; therefore, a rigid set-up is important. Here a large diameter cutter arbor is used, and the arbor supports are so set hat the arbor and cutter have little tendency to deflect. Finally, a special steadyrest supports the center of the long shaft—it has a bronze sleeve that prevents marring the splined edges. The sleeve extends above the longitudinal axis of the shaft, thereby counteracting the thrust of the cutter regardless of whether convention or climb milling is used. Best results are obtained if conventional milling is used for the roughing cuts, and climb milling for the finishing cuts. The later leaves a sharp clean edge on the spline

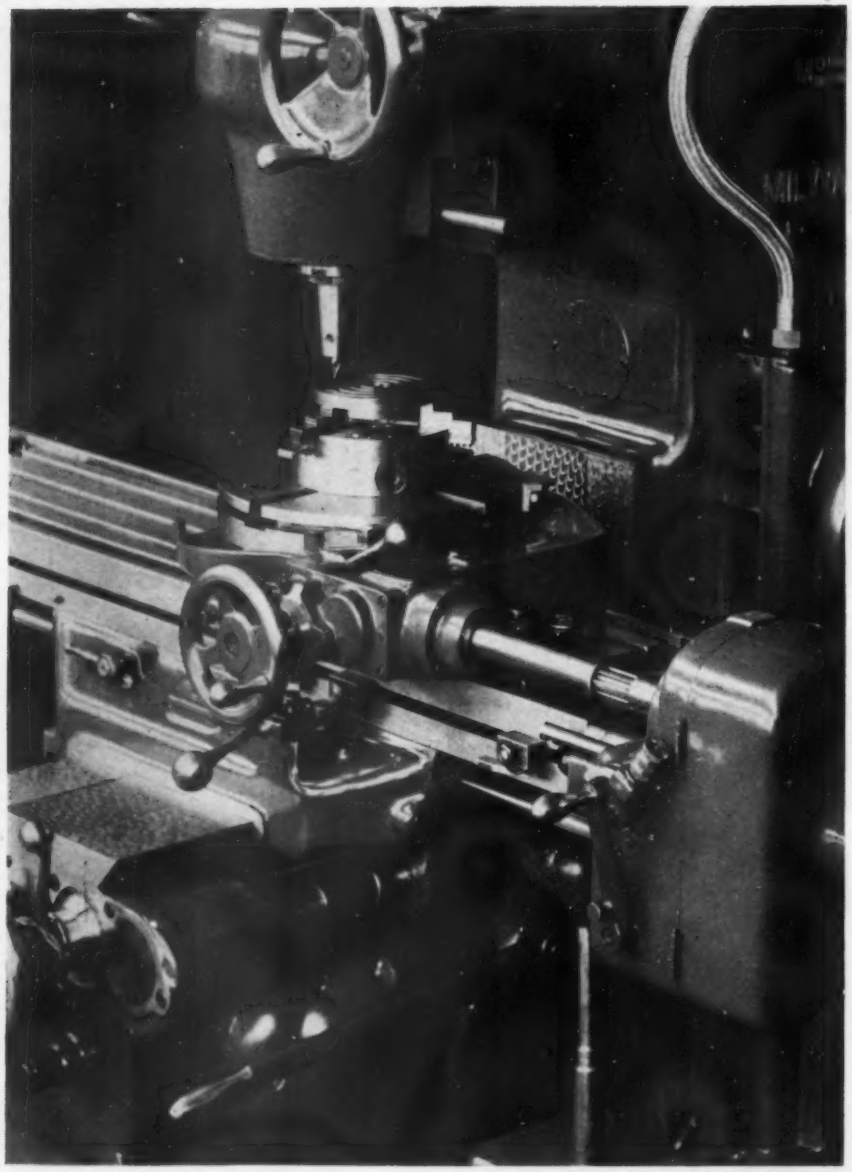


Graduations on the circular base of a table can be milled with the illustrated set-up. The workpiece is clamped to a 16-in. rotary table mounted on the machine table, and a boring bar is mounted and clamped in the spindle of the milling machine to serve as a toolholder for the high-speed steel toolbit. Cutting the graduations is accomplished by holding the toolbit stationary, and raising and lowering the knee of the machine with the hand crank. The toolbit is ground properly for cutting graduation marks. The rotary table, equiped with an index plate, is indexed 1 deg. for cutting each graduation. The graduations must start at the front center and proceed from 0 to 180 deg., and then in the opposite direction from 180 to 0 degrees

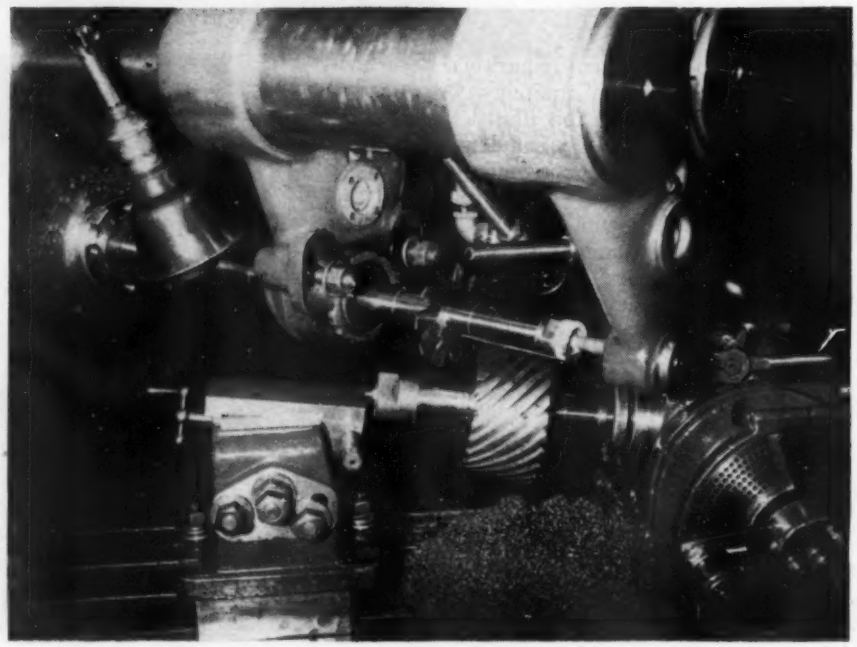


Collets must be graduated frequently, using available toolroom equipment; such a set-up is shown in this illustration. The graduating tool, ground to produce the graduation marks required, is held in a vise bolted to an angle plate that in turn is mounted securely on the over-arm of the milling machine. The collet to be graduated is held in a chuck and secured by a bolt and clamp through the spindle of 12-in. dividing head. The latter is tilted to that angle which retains the proper relationship between the toolbit and the face of the collet to be graduated. On this job, the collet was indexed for each long graduation, which was cut by feeding the table longitudinally with the hand crank. Then the collet was indexed for each of the smaller graduations. All graduations were cut by raising the knee of the machine.

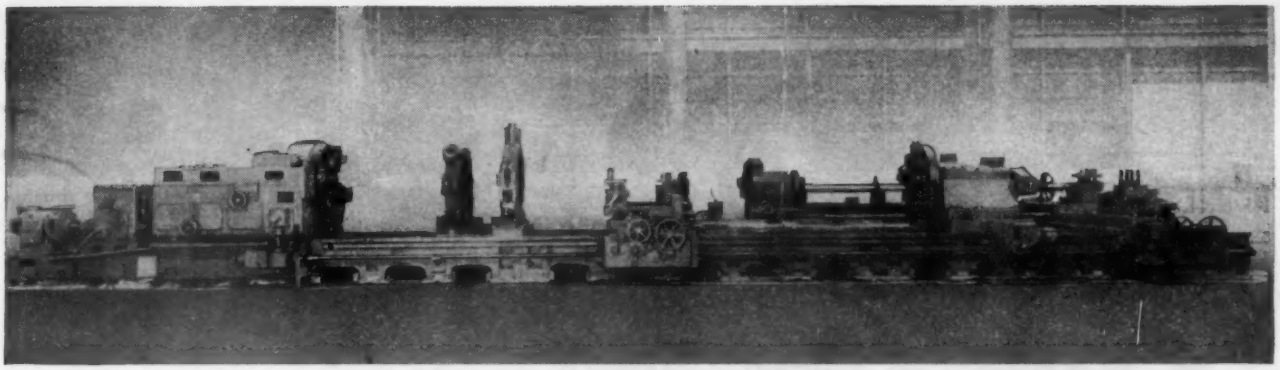




Spiral cam tracks in a flat plane are milled by mounting the workpiece on a rotary table and using a low-lead drive. The spiral cam illustrated has a track 3/8 in. wide, 1/4 in. deep and a lead per revolution of 1½ in. plus or minus 0.003 in. The table screw was ground accurately and the low-lead gears lapped to maintain the required tolerance. The set-up was checked by milling a spiral track in a cast-iron plate, and mounting it between centers of a dividing head. Various positions on the track were then checked with a height gage, an indicator reading in 0.001 in., and Johanasson blocks, the plate being indexed and the lead checked by transferring the height of a stack of blocks to the cam track with the indicator. The ratio of the 16-in. rotary table worm and wormwheel used in this set-up is 80 to 1. Since the leads listed in a master lead book are calculated for a dividing head with a 40 to 1 gear ratio, a ¾ in. lead is selected for the rotary table in order to produce the necessary 1½ in. lead on the cam track. The change gears interposed between the table screw and the drive shaft to the rotary table were then selected to produce the ¾ in. lead of the tracks in cam plate



Helical fluted reamers can be milled in the illustrated set-up. The diameter at the small end of this reamer is 5.0625 in., while the length is 2¾ in. It has 25 left-hand teeth, right-hand cut, which are milled at a mean helix angle of 45 deg. The included angle is 20 deg.; therefore, the tailstock is tilted 10 deg. The lead is 17.43 in. The gearing required to drive the dividing head for this lead is: A = 23, B = 30, C = 36, D = 38, F = 24 and G = 8. The helix angle is obtained by setting the table of the universal miller at 45 deg. A 2½ in. form cutter is used and run at 60 r.p.m. The feed is 3¼ in. per min. If an indexing plate with 100 holes is chosen and a dividing head with a five-to-one gear ratio is used, then indexing is accomplished by moving the crank through an arc of 20 holes



This 72 in. x 50-ft. lathe with four saddles is used in the Bendigo (Victoria) Ordnance Factory. It was assembled in Queensland from parts made by 94 subcontractors

War Spurs Australian Industry

BY F. W. McINTYRE, VICE-PRESIDENT AND GENERAL MANAGER, REED PRENTICE CORPORATION

Handicapped by slow deliveries on shop equipment the South Pacific commonwealth turned out its own machine tools and expanded production on aircraft, munitions and other war products

AUSTRALIA has built for her own war needs some 18,000 machine tools since September, 1939. Such a manufacturing program was necessary because of the impossibility of securing satisfactory deliveries from England, Canada or the United States. Types of machines produced include large planers, boring mills and lathes, as well as portable tools, small drill presses and grinders.

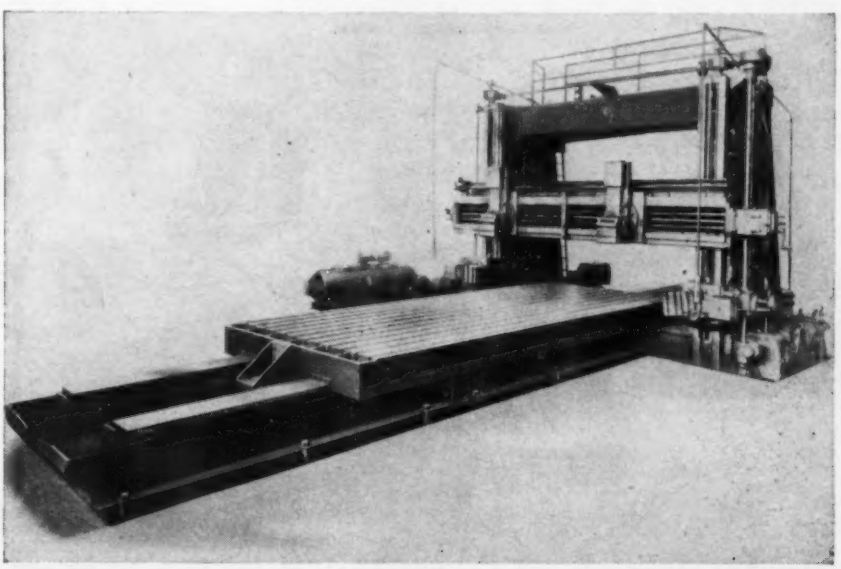
Expansion of machine tool manufacture was given particular emphasis after Pearl Harbor, because shops had to be equipped as quickly as possible to make aircraft, tanks, guns and ammunition. In addition, plants were tooled up to produce cutting tools, grinding wheels and carbide-tipped tools, much of the materials and equipment for these plants coming from the United States through Lend-Lease.

The result of this major expansion is that Australia after the war will be able to make all types of equipment needed in her own industries and also will be able to meet some of the requirements of Far Eastern countries. The new machine tool facilities have advanced Australia 50 years industrially.

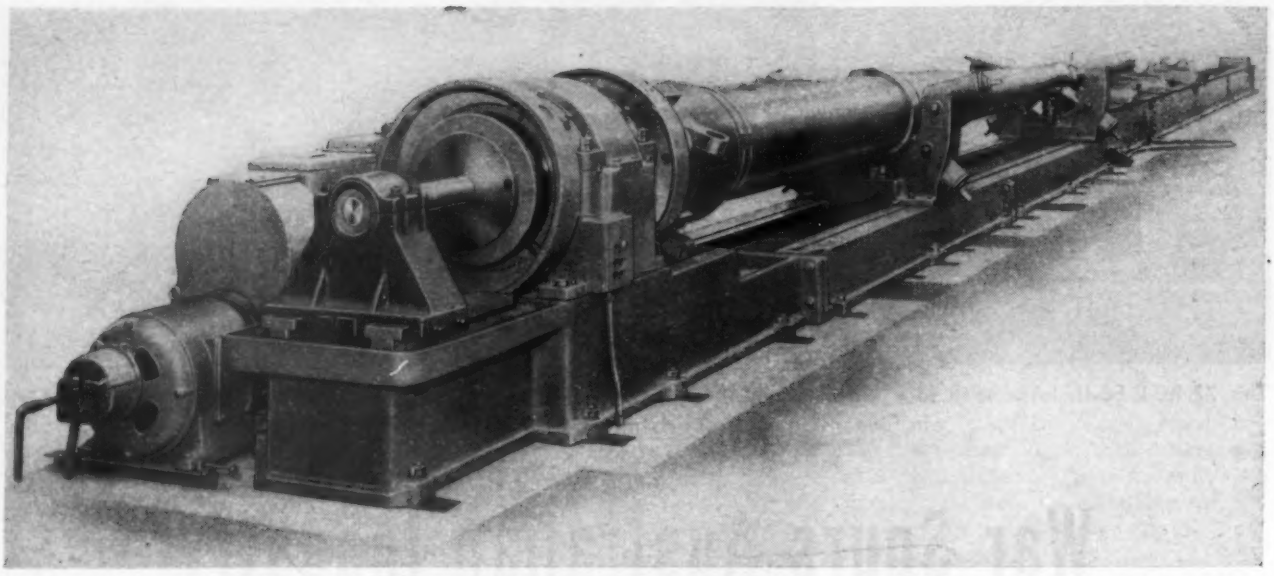
Many shops building machine tools today are called in England and Australia "engineering plants." They build special machines to do general repair work. Some progressive government railroad plants make turret lathes. They also make gages, hobs, taps, dies and milling cutters. One of these railroad plants operates shops for forging and finishing shell. In one section of the car shops aircraft fuselages and wings are made. Companies that formerly assembled automobiles, making only the bodies and importing other parts, are successfully producing guns and ammunition.

One government arsenal produces shell cases from raw copper to the finished product. It also has a well equipped die-casting department turning out die cast fuses and other munitions parts. It has recently completed additions to a manufacturing plant to furnish range-finder equipment, telescopes, binoculars and all necessary equipment, including prisms.

The aircraft industry is housed in new plants with modern American equipment and tooling. Engines and all accessories for planes are made.



Designed by Fred Merrett, Ministry of Munitions, and built by Australian Iron & Steel, Ltd., this planer has rail heads provided with cross planing feeds and slotting attachments. It is 14 ft. wide, 10 ft. high and has an 18-ft. stroke



Australian Iron & Steel, Ltd., in Kembla, N.S.W., manufactured this boring lathe capable of handling up to 8-in. Naval guns

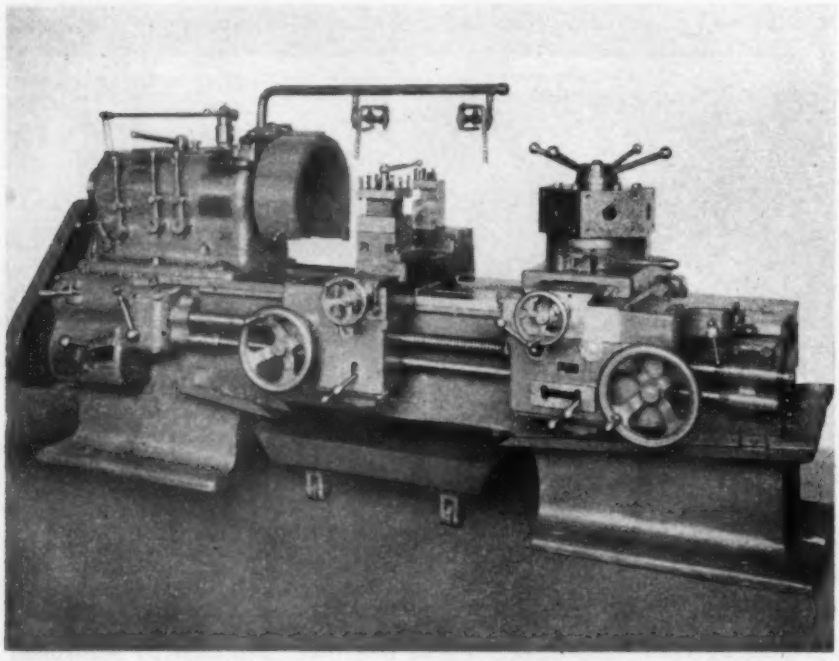
Complete planes are being produced.

Many small shops are manufacturing surface grinders, 1-in. to 2-in. turret lathes and No. 1 and No. 2 production milling machines. The building of large machine tools is an outstanding achievement. These include vertical boring mills up to 8-ft. capacity and planers for shipyard and steel mill maintenance work up to 10-ft. square and 30-ft. length, with milling feeds to the table and crossfeeds for the milling heads providing cross planing and cross milling. The rail heads of these planers are equipped with slotting attachments with 18-in. stroke.

Australia also makes 6-in. diameter spindle horizontal boring mills and large gun lathes for the turning and boring operations. Standard lathes up to 36-in. to 42-in. swing are built too. All of these machines are copies of good types of American or British machines.

Hydraulic presses and hydraulic pumps, through sheer necessity, have been made in Australia rather than imported. These products are found in almost all Australian war manufacturing plants.

After Pearl Harbor, Australia faced a perilous situation and could not risk being entirely dependent upon the tenuous and dangerous supply lines reaching from the United States to her. It was difficult for her to decide quickly exactly what should be done with her own facilities and how much they should be expanded. In all of her calculations she had foremost in mind her limited supply of manpower drawn from a population of only seven million people, though her area is nearly as large as that of the United States. In view of the limiting factors, Australia has utilized her resources well, having made relatively few mistakes.



Another machine tool manufactured and assembled in New South Wales is this 25-in. swing special turret lathe

Serves U. S. Forces

Supplementing her manufacturing activities on behalf of her own armed forces, Australia has furnished large numbers of maintenance machines and tools to the United States army and navy. Many of her shops are working on maintenance jobs for American units, especially in overhauling aircraft engines.

The entire expansion and manufacturing program in Australia has been supervised by Colonel F. G. Thorpe, director of machine tools, Ministry of Munitions, working under Essington Lewis, director-general of munitions. Colonel Thorpe has spent years in the production and sale of machine tools in Australia.

Before the war Australia made a few standard type tools for maintenance purposes, such as lathes, shapers, drill presses and grinders, but imported from England, Germany and the United States all of her machines for manufacturing her peacetime products. Large machine tools for maintenance work also were imported.

Rotary Table Reduces "Down" Time

TWO-POSITION work tables are used by the Crane Company to save set-up time in drilling flange bolt holes in large valve bodies. These tables are used with multiple-spindle machines which drill from four to sixteen holes in each flange, depending on the size and type of the valve or fitting.

Formerly a machine stood idle while the operator removed the drill jig, unloaded the work piece and put another in its place. Use of the rotating table enables the operator to set up a valve body at one end of the table, while another is being drilled at the opposite end. "Down" time is reduced to the interval required to turn the table end for end bringing the new piece under the drilling spindle.

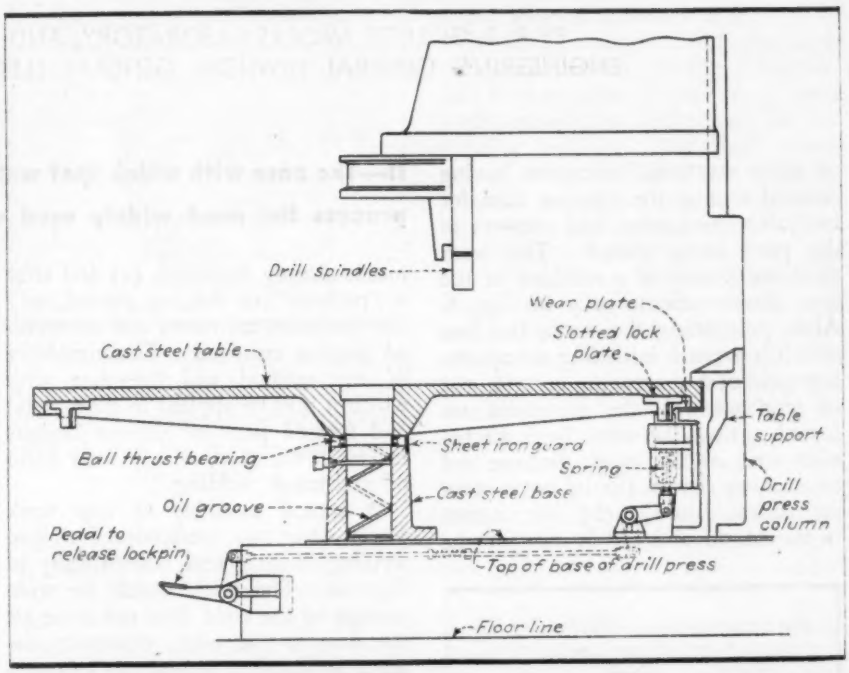
The work tables are in two sizes. The smaller has a top surface 6 ft. × 32 in.; the larger, 7 ft. × 38 in. They are made of one-piece alloy iron or steel castings.

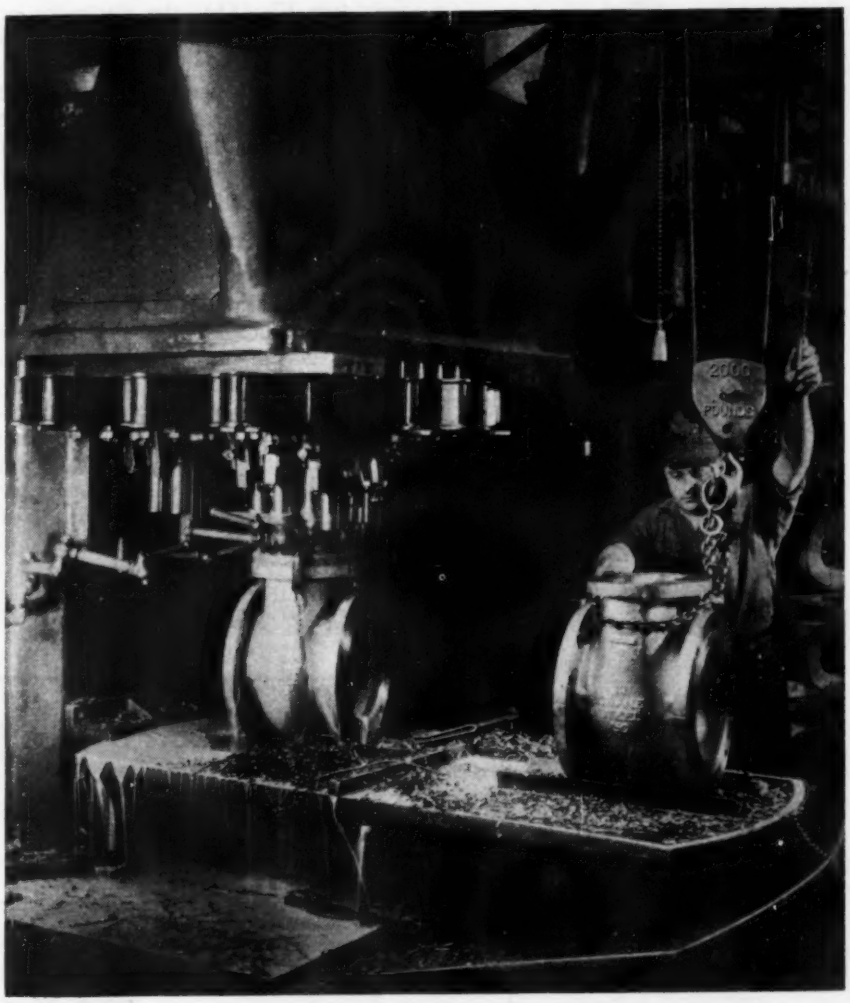
An oil groove around the top surface of each table collects the coolant which drains through a hole in the side to prevent its running off the end. As an additional precaution against coolant spillage, a sheet-metal drain pan attached to the base of the machine extends under the projecting end of the rotary table.

Bracket Supports Inner End

The weight is carried by a large thrust ball bearing fitted around the vertical table shaft. A cast steel support bracket attached to the column has a horizontal slot into which the inner end of the table slips when it is brought into drilling position. A heavy steel wear plate is fitted to the lower surface of this slot.

The weight of the casting, plus the pressure of the drills, holds the larger table sufficiently tight against the wear plate to prevent movement during the drilling operation. For the 6-ft. table, however, a lock pin has been added to hold the table in position while a part is being drilled. The lock pin is released by a mechanism operated by a pedal at the outer end of the table.





An electric jib crane hoists a valve body to the outer end of the rotary table while the multiple spindle machine drills a workpiece at the opposite end of the table

How to Use Resistance Welding

BY R. T. GILLETTE, WORKS LABORATORY, AND J. F. YOUNG,
ENGINEERING GENERAL DIVISION, GENERAL ELECTRIC COMPANY

II—The ease with which spot welding may be applied has made this process the most widely used of any of the resistance methods

IN SPOT WELDING, electrodes having reduced area at the tips are used for localizing the current and pressure in the parts being joined. The work parts are placed in a machine of the type shown schematically in Fig. 5. After positioning the work, the foot switch is pressed, initiatiing the operating cycle of a sequencing control, and in sequence (a) the electrodes are forced against the work by a mechanism such as the toggle linkage and air cushion shown (or by some other mechanical means), (b) the current is turned on and off by one of the means already described, (c) and after a "push-up" or forging period, (d) the electrodes are raised and the welded part is removed. The simplicity of the method and the ease with which it may be applied to sheet-metal and formed parts of various designs makes it the most widely used form of resistance welding.

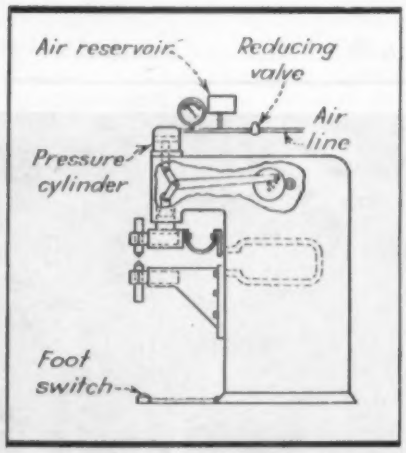


Fig. 5—A spot welder has three essential elements: the electrodes, a point of power control and a means of applying pressure

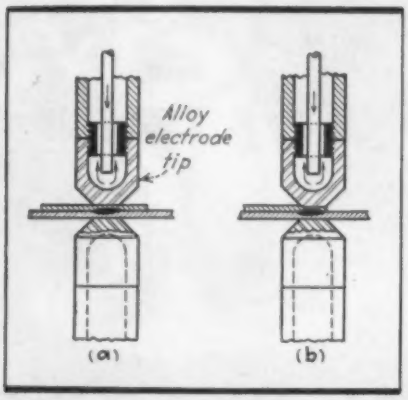


Fig. 6—If the stock is not wide enough to be away from the weld (as at a) the soft metal will be squeezed out (as at b)

A typical assembly of two work pieces and two electrodes for spot welding is illustrated schematically in Fig. 6*a*. The stock should be wide enough so the weld does not come all the way to the edge, otherwise the metal softened in welding is squeezed out (see Fig. 6*b*), the electrodes or the parts skid, and a weaker weld with poor appearance results. If desired, the extra flange width may be trimmed off after welding, but there should be cold metal on all sides of the weld to confine the softened area during the welding process.

Electrode Maintenance Important

The current density throughout the weld area will be reduced by wearing and mushrooming of the electrode points, and if this is allowed to go too far, no weld will be produced. For example, a point ¼ in. in diameter has an area of 0.049 sq. in.; if this point is allowed to wear and mushroom to 5/16 in. in diameter, or an area of 0.077 sq. in., a change of current density of approximately 36 percent results. Good electrode maintenance is, therefore, necessary for production of reliable welds.

The spot-welding method is used for fabricating all types of sheet-metal structures where mechanical strength rather than water or air tightness is required. Fig. 7 illustrates some of the more frequently used joints. Such joints may be applied to all types of boxes, cans, inclosing cases, all-metal vacuum tubes, automobile body and chassis construction, light-weight high-speed train construction, freight car building, electric locomotive cabs, panel and other construction on all-metal houses, kitchen utensils and aircraft.

Many arrangements other than those in Fig. 7 are used for applying the electrode to the work. Two of these are shown in Fig. 8. The method shown in Fig. 8*a* is one way of making several welds at one time. The separate spot welds must be some distance apart to avoid shunting the current through the work. Fig. 8*b* illustrates a method used for welding without producing surface marking on one side of the weld.

When the electrodes are applied to the work as in Fig. 6*a*, there will always be some surface marking due to heat shrinkage, even if the work surface does not get heated enough to cause discoloration. During heating, the work under the electrode must expand in a horizontal direction, but during cooling the contraction takes place both in the horizontal and the vertical direction, resulting in a ridge a few thousandths of an inch high around the electrode tips and a slightly

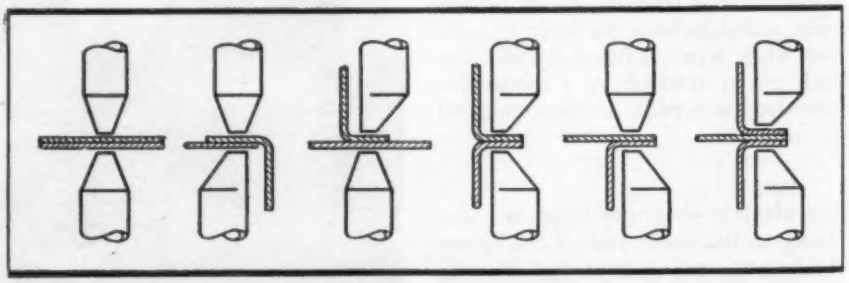


Fig. 7—Here are some typical spot welded points; but these are by no means all of the possibilities

concave work surface under the tips.

It is impossible to eliminate these marks completely, but they can be minimized by welding in a short time and by using a much larger electrode on the surface to be unmarked. Another method of getting a smooth surface is to shape the electrode so as to get a slight upset at the weld and dress this off after welding.

Practically all combinations of ductile metals and alloys can be spot welded. Some, like copper to aluminum, and aluminum to magnesium, form alloys of practically no strength. Others, such as zinc and some of the high-chromium alloys, experience grain growth even during a very short welding period.

Fig. 9 shows a photomicrograph of a satisfactory weld in two pieces of 0.037 in. thick 18-8 stainless steel sheet. Note that in the short welding time used the material was affected only part way through the sheet, and the original strength and corrosion resistance of the material are still retained. The short welding period is also necessary in stainless steel to prevent carbide precipitation when the carbon content is high enough to permit it. High-carbon steels weld readily but the weld will be in the full hardened state and will require heat-treatment which can be accomplished automatically by a control which applies pre-heating, post-heating or both as timed elements of the welding cycle.

Zinc-alloy die castings can be welded with little loss of strength, but the ductility is reduced. Free-turning Bessemer screw-machine steel frequently refuses to weld, or results in brittle welds, and hence its use for welded parts should be avoided. Usually, however, when clean, properly prepared

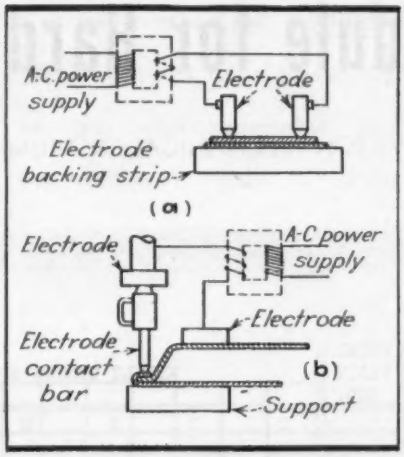


Fig. 8—Two special applications: (a) a set-up for multiple spot welding; and (b) a method of welding which will not show the spot on one side of the assembly

metal parts are spot welded, the strength of the welds is perfectly satisfactory. Table I shows combinations which have been successfully welded; many other combinations may also be satisfactorily welded. Copper and silver are difficult to weld, but they may be welded by the use of low conductivity electrodes (e.g. Elkonite and Trodaloy). In many applications, the weldability of copper is increased if it has a tinned surface.

Parts of widely different thickness may be spot welded. For example, 1/64-in. material can be welded to a 6-in. piece and would require only slightly more power input and pressure than to weld two pieces of 1/64-in. material as it is not necessary to heat the 6-in. piece through, and the push-up is all obtained on the thinner piece. The limit to welding pieces of equal thickness with an uninterrupted flow of current seems to be approximately 1/8 in. Greater thicknesses may be welded by a new technique known as pulsation welding, which will be discussed later.

Welding equipment of the type shown schematically in Fig. 5 is available in many sizes for use on all parts small enough to be brought to the welding machine. For parts which are too bulky or heavy to be readily handled, such as automobile bodies, and freight car frames, portable equipment (called a welding gun, see Fig. 10) is available. This equipment has limitations in gage of material that can be welded and has high maintenance costs so that, where possible, the use of the press type of welder is preferred. In applications where the production justifies the cost, special equipment having multiple electrodes and assembly fixtures can be justified. Many modifications can be built into such machines to speed up their operation and make them largely automatic.

Table I—Combinations of Metals That Can Be Welded Successfully

METALS	Aluminum	Ascoloy	Brass	Copper	Galv. iron	Iron	Lead	Monel	Nickel	Nichrome	Tin plate	Zinc	Phos. bronze	Nickel silver
Aluminum	○										○	○		
Ascoloy		○	○	○	○	○		○	○	○	○		○	○
Brass		○	○	○	○	○		○	○	○	○	○	○	○
Copper		○	○	○	○	○		○	○	○	○	○	○	○
Galv. iron		○	○	○	○	○	○	○	○	○	○		○	○
Iron		○	○	○	○	○		○	○	○	○		○	○
Lead					○		○				○	○		○
Monel		○	○	○	○	○		○	○	○	○		○	○
Nickel		○	○	○	○	○		○	○	○	○		○	○
Nichrome		○	○	○	○	○		○	○	○	○		○	○
Tin plate	○	○	○	○	○	○	○	○	○	○	○		○	○
Zinc	○		○	○			○					○		
Phos. bronze		○	○	○	○	○		○	○	○	○		○	○
Nickel silver		○	○	○	○	○	○	○	○	○	○		○	○

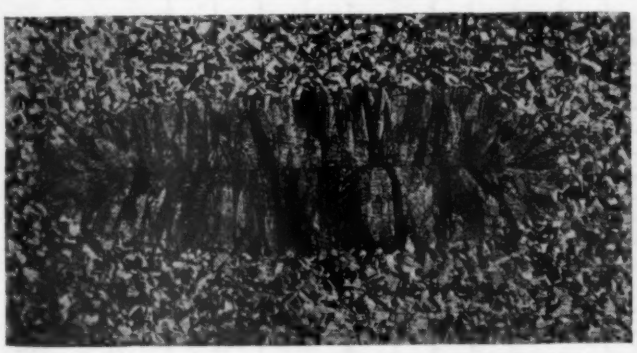


Fig. 9—This photomicrograph is of a weld made in two pieces of 0.037 in. thick 18-8 stainless steel. Welding time: 1/60 sec. Note that the heat affected zone is approximately half way through

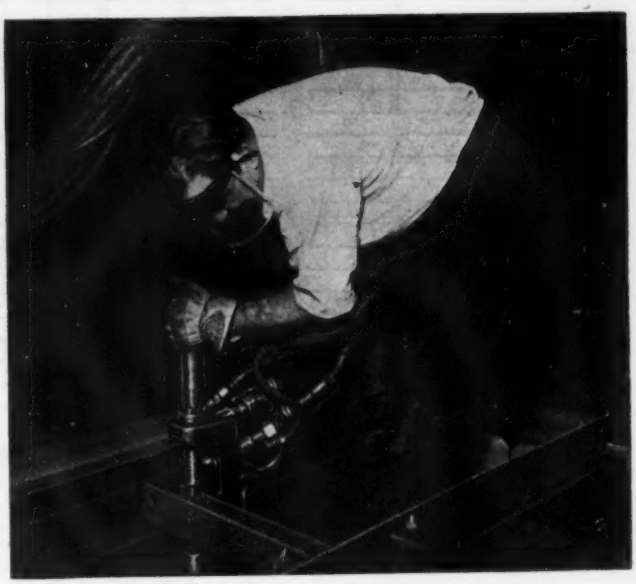


Fig. 10—A resistance-welding gun is used to fabricate a switch-gear cubicle

A Parts Schedule for Hardness Testers

BY A. A. BLUE, WILSON MECHANICAL INSTRUMENT COMPANY

PART X-31619

Used In	Req. Ea.
1 JR	2
3 JR	2
4 JR	1
4 JR-BB	1
4 JR-GN	1
5 JR	1
5 JR-BB	1
5 JR-GN	1
1 JS	2
3 JS	2
4 JS	2
4 JS-BB	2
4 JS-GN	2
5 JS	1
5 JS-BB	1
5 JS-GN	1
3 VR	2
3 VS	1
3 OS	1
3 OR-6"	3
3 OR-7"	3
3 OR-8"	3
3 OS-6"	4
3 OS-7"	4
3 OS-8"	4
XR-HEADS	1
XM-HEADS	1
XS-HEADS	1
4 PR	2
4 PS	1
6 EM	
6 ES	

Fig. 1—The parts sheet lists the number of parts of a particular kind needed to assemble each type of tester

TESTER QUAN.	TOTAL PARTS REQ.	WEEKLY TESTER SCHEDULE														TESTERS
10		2		2		2		2		2						1 JR
15			3		3		3		3		3					3 JR
10		2		2		2		2		2						4 JR
5		1		1		1		1		1						4 JR-BB
5		1		1		1		1		1						4 JR-GN
10		2		2		2		2		2						5 JR
3		1				1				1						5 JR-BB
3		1				1				1						5 JR-GN
12			2		2		3		2		3					1 JS
12			3		3		2		2		2					3 JS
8			2		2		2		2							4 JS
2											2					4 JS-BB
2										2						4 JS-GN
6			1		1		1		1		2					5 JS
2		1		1												5 JS-BB
2				2												5 JS-GN
8			1		1		2		2		2					3 VR
6			2		2		1			1						3 VS
6			1		1		1		1		2					3 OS
8			1		1		2		2		2					3 OR-6"
6			2		1		1		2							3 OR-7"
5			1		1		1		1		1					3 OR-8"
6		1		1		1		2		1						3 OS-6"
6		2		1		1		1		1						3 OS-7"
6		1		2		1		1		1						3 OS-8"
4						2		2								XR-HDS.
4						2		2								XM-HDS.
4						2		2								XS-HDS.
6		1		2		1		1		1						4 PR
6			1		1		2		1		1					4 PS
3		1		1					1							6 EM
3					1		1				1					6 ES

Fig. 2—The schedule gives the number of testers of each type to be manufactured in a stated period of time

IN ITS MANUFACTURE of the Rockwell hardness tester, the Wilson Mechanical Instrument Company is continually working on improvements to extend the field of usefulness of the hardness values. These improvements have resulted in motor-operated machines, machines with less manual effort, internal testers and superficial testers which have obviously added to the types of testers available; instead of but a few sizes of one or two models, the list has become relatively extensive.

As a result, ordering parts for a varied schedule of Rockwell testers becomes complex. Some parts are used in all models; some parts are used in various quantities in a few models; some parts are used in only one model; some in other combinations. Where similar conditions exist, usual practice is to depend upon a few experienced employees, who have grown up with the business, to unravel the various combinations of parts and come up with the balanced totals. This method is slow, not subject to ready check, and with present difficulties in securing draft deferments, is of uncertain duration.

The problem is a purely mechanical one. Once the schedule of assorted testers to be built is determined, it then becomes simply a matter of multiplying and adding in the right places, to get the final answer. Large manufacturers are justified in the use of elaborate mechanical office equipment for this purpose which is not warranted in smaller organizations. The following method has been devised to provide for substantial mechanization of this function in smaller plants with a means readily available to such organizations.

Use of a standard duplicating machine gives a quick summary of the interchangeable parts for different types of testers

The method involves the use of some of the well known rotary duplicating machines on the market. Two master forms are used, illustrated in Figs. 1 and 2. Fig. 2 is used to include the variety of testers scheduled for any given period, e.g. month, two months or quarter. At the right of this form is a column listing the symbols of the various testers manufactured, each symbol occupying one line. At the left is a column in which the total quantities of each type of tester to be made in this period are entered at the time the schedule is set up. Other columns are provided to show how this total number is to be delivered by weeks during the over-all schedule period.

Two Forms Combined

Fig. 1, is a narrow form, of the same length as Fig. 2, and carrying the same number of horizontal lines, identified in the same manner as to respective Rockwell tester symbols. At the top of this form is a space for entering an individual part number, and in a second column beside the symbol of each tester, is a space to enter the quantity of the part in question that is required for each tester. In other words, each narrow master, Fig. 1 when made out, one for each part in the combined bills of material for all testers, becomes a use index for each individual part, by testers.

Forms shown in Figs. 1 and 2 are then combined. This is done, by mounting Fig. 2 on the drum of a rotary duplicating machine, and placing beside it Fig. 1 for, let us say, Part X-31619. A blank sheet of paper is run through the duplicating machine and comes out with a combined impression of both forms, as shown in Fig. 3.

Here we then have a complete story of the requirements of Part X-31619 for the entire schedule. By multiplying the parts required for each individual tester, by the number of testers required, the total parts for each type of tester is determined and the addition of all such extensions for the entire list, gives the overall requirements for the part.

After such a sheet for part X-31619 is run off, the narrow master for this part is removed, and that for the next part is put in the machine and the procedure repeated. This is carried out for each part in all bills of material, and the final result is a sheet for each part, telling just how many will be needed for the entire schedule, and also when they will be needed by weeks during the schedule period.

Like most such operations, this is much more easily performed than described. It involves keeping the masters for each part strictly up to date, with respect to their usage, but thenceforth it becomes a purely mechanical procedure of printing the matched masters and of simple extensions and additions. All of these operations can be readily verified for accuracy, and the entire job done by an office employee of normal accuracy in handling adding machines, no special knowledge of the product being necessary to develop these figures.

PART X-31619		TESTER	TOTAL PARTS	WEEKLY TESTER SCHEDULE												TESTERS
USED IN	REQ.EA.	QUAN.	REQ.													
1 JR	2	10	20	2		2		2		2		2				1 JR
3 JR	2	15	30		3		3		3		3		3			3 JR
4 JR	1	10	10	2		2		2		2		2				4 JR
4 JR-BB	1	5	5	1		1		1		1		1				4 JR-BB
4 JR-GN	1	5	5	1		1		1		1		1				4 JR-GN
5 JR	1	10	10	2		2		2		2		2				5 JR
5 JR-BB	1	3	3					1				1				5 JR-BB

Fig. 3—By combining the schedule and the parts list on a duplicator and extending the figures the total requirements for the period may be quickly determined

Primer coat is brushed on, after a preliminary rough grinding, to insure penetration into pores and cavities

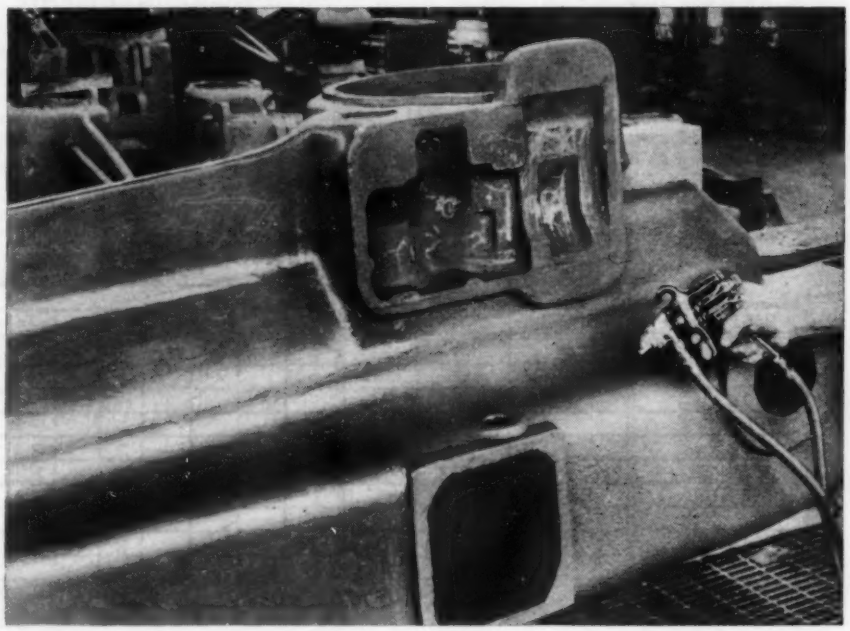
A Good Finish Despite War Restrictions

BY GORDON H. ROBERTSON, INDUSTRIAL FINISHES DIVISION, THE SHERWIN-WILLIAMS COMPANY

THE STRICT UTILITARIAN NATURE of a machine tool is probably its outstanding characteristic. Its ability to cut and shave metal into usable shapes ranks first in any evaluation, but machine tools are controlled by human beings so the factor of visual appearance enters the picture.

While it is true that a tool whose visible surfaces are marred, uneven and dull does not necessarily produce inferior work, it is just as true that a bright, smooth finish on a drill, lathe or press does create in the operator a sense of pride in the tool's appearance. It is only natural to expect, therefore, that he will be more conscientious about taking care of the tool and seeing that it is kept clean and properly lubricated.

This is a fact that had long been recognized by the Cincinnati Bickford Tool Company, makers of heavy-duty radial and upright drills. Cincinnati Bickford technicians developed a smooth, glossy surface that was capable



Large arm and base casting are sprayed with pebble finish over a floor exhaust grill

of being easily wiped free of oil, grease and dirt. The finish was standard machine tool gray, bright, attractive and durable. When received from the foundry at Cincinnati-Bickford, gray iron castings were ground with carborundum wheels to remove all shags, gate marks, seams, rust and other blemishes. Overhead hoists then carried the casting to the finishing room where it was given a primer coat of paint. Next, two coats of filler were applied with knives to smooth out these surface irregularities not removed by grinding. The filler itself was smoothed by brushing with turpentine and camel's hair brushes.

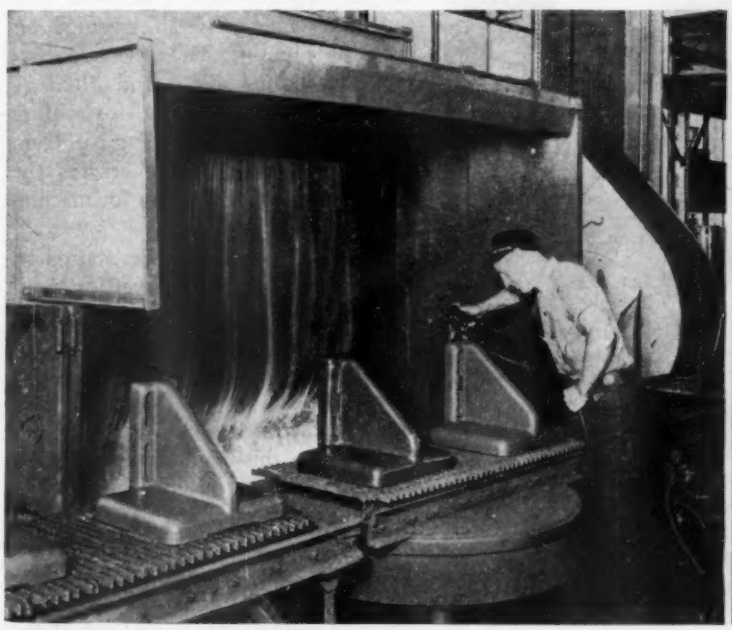
After a 12 to 14 hour stand to permit the filler to set and harden, the casting was then sanded and a sealer coat of paint applied. When the piece had been put through the required machining operations and assembled as part of the completed drill, it was given a final touch-up coat. The finished drill had a hard, smooth surface, attractive and easy to keep clean. Consequently, the operator tended to keep his machine in good working order, the shop took on a neater appearance and the cause of "good-housekeeping" in plants was substantially furthered.

Faced with a tremendous backlog of unfilled orders, the machine tool industry, in conjunction with WPB officials, began to look for means of speeding up production. All secondary operations were carefully scrutinized and finishing became the first casualty. For, on April 27, 1942, WPB issued Order -108 which imposed the following restrictions. First, only one coat of primer or sealer was to be applied. Second, no filler could be used. Third, not more than two coats of paint, enamel or lacquer could be applied. Finally, no color other than "old machine tool gray" could be used for the final coat.

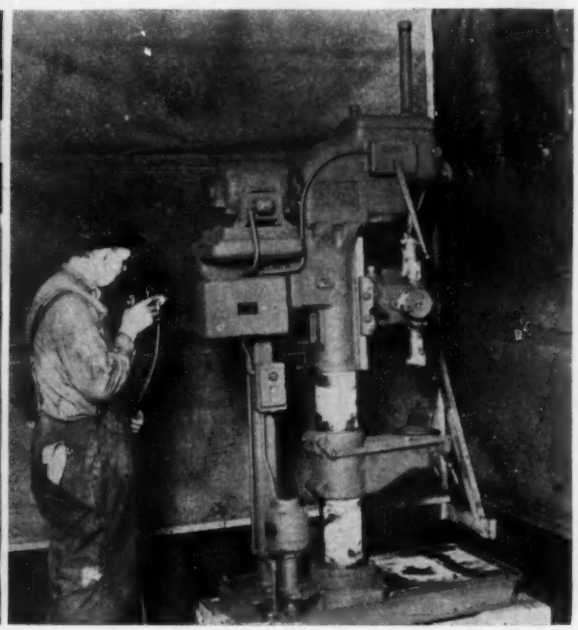
At first glance, the effects of the order might seem unimportant, as finish or the lack of it on a machine tool does not affect the efficiency of that tool's operation. But, in the opinion of the Cincinnati Bickford Tool Company, a rough, unattractive finish did not help the machine's effectiveness and, with only a primer and two finish coats of paint, the tool's surfaces showed up crude and unfinished with even minute scratches magnified. The company's executives, therefore, determined to continue production of their drills with the best finish obtainable under the new restrictions. To that end, producers of industrial finishes, were called in and given the problem.

It was almost impossible to remove surface defects without the aid of a filler. Prolonged grinding consumed too much time and the present glossy finish which reflected light only served to magnify defects. So the most practical course seemed to be the use of a finish which would absorb light and minimize the defects. The Sherwin-Williams Company recommended a spatter-type or "pebble" finish which accomplished three purposes. First, it made practically invisible all scratches, grinding scars and other surface defects. Second, it added immensely to the appearance of the tool, being a uniform, decorative finish. Third, and most important, after the casting has been rough ground, only one coat of primer was required to produce an acceptable finish. So favorably has the new finish been received by users of the company's drills that Cincinnati Bickford is seriously considering adopting the "pebble" finish or some adaptation of it as standard practice after the present restrictions have been lifted.

The practice in applying the finish at Cincinnati Bickford is as follows: The gray iron casting is given a preliminary rough grinding to remove prominent surface defects. It is then transferred to a highly mechanized paint room where the initial coat of primer is applied. This coat is brushed on to insure greater penetration of the paint into the casting pores and cavities. Drying time is less than 10 min. Because their bulk and weight makes frequent handling impractical, large arm and base casting are next sprayed with the pebble finish over a floor exhaust grill. Smaller castings are mounted on grills which move over a roller conveyor before a water-wash spray booth where they are quickly sprayed with the pebble finish. Drying time here, too, is less than 10 min. After the castings have been machined and assembled, the complete tool is carefully examined and all spots marred or scratched during machining are touched up. The tool is then given a finish coat of standard machine tool gray. Pebble finish effectively covers all major surface defects, yet it requires from 1/3 to ½ less time, effort and materials than the original method.



Small castings are sprayed as they move over a roller conveyor before a water-bath spray booth



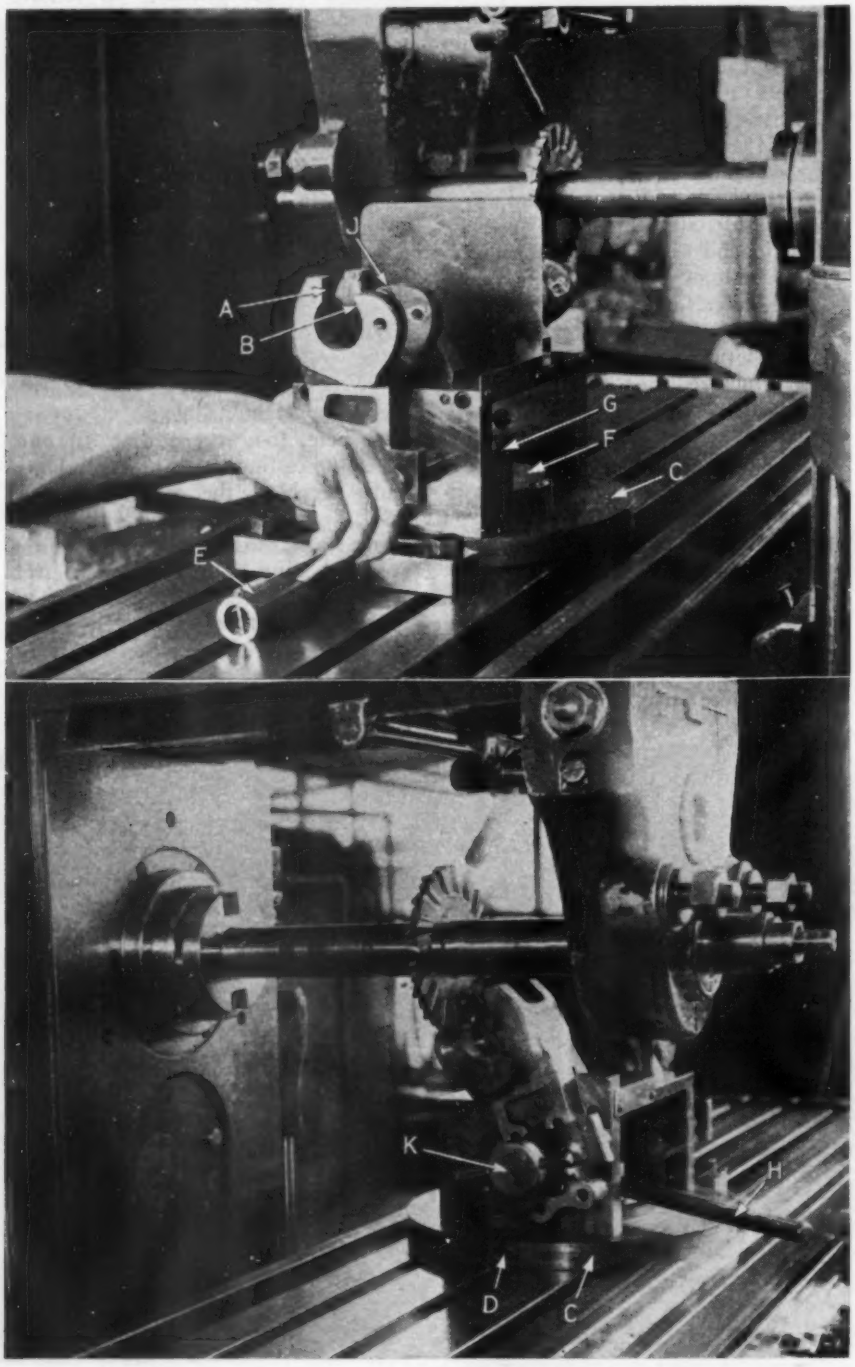
After assembly the machine is examined and all mars and scratches are touched up

Ideas From Practical Men

Indexing Fixture Eliminates Handling Time

BY G. H. GROSCHKE
General Electric Company

The illustrated fixture was designed to mill surfaces *A* and *B* on a large quantity of castings in lots great enough to meet assembly demands and yet hold milling machine utilization to a minimum. The machining of this casting, with surface *A* parallel to the center line and surface *B* at an angle of 20 deg. to the center line and tangent to the bore, was done previously in two fixtures, requiring a total time of 8 min. per casting. Each casting is now machined in 4 min.

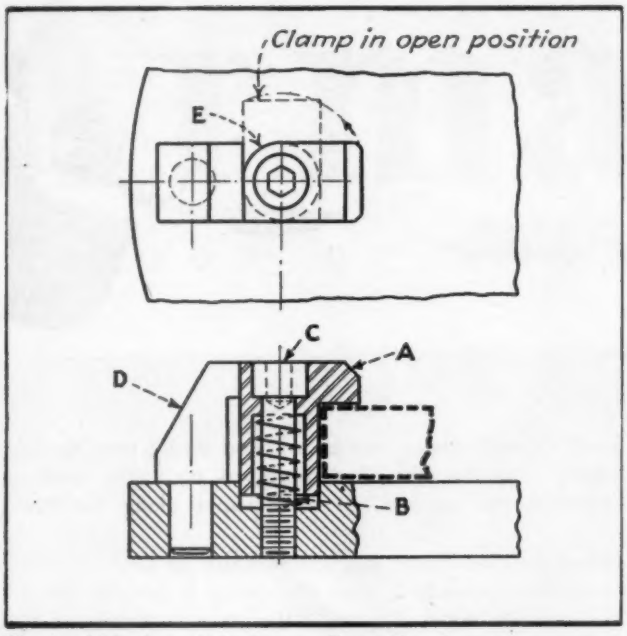


This indexing fixture replaced two single fixtures for milling two surfaces on a slot in the casting. As a result, production was increased 100 percent

The new fixture is mounted on plate *C* having two holes *D* diametrically located for the necessary 180 deg. indexing. These holes receive a pin actuated by rifle-locking device *E*. Base plate *C* swivels on a threaded plug keyed and bolted to the machine table and fitted with washer *F*. Nut *G* engages the thread on the plug and has a hole in its circumference for the insertion of lever *H*. This lever, in conjunction with the rifle bolt, controls the indexing and clamping of the fixture to the machine table.

Two plugs *J*, welded to each of two small pedestals, extend toward the ends of the fixture. A small section of each plug, the diameter of which is a sliding fit for directly locating the bore of the casting, is cut away in a relative right-and left-hand manner for its entire length to accommodate the necessary over-run of the milling cutter. Protruding from each end of the fixture is a guide pin over which each of the two castings is positioned at the same time they are mounted on cut-away plugs *J*. Thus the two castings are located at 90 and 70 deg., respectively, to the vertical for milling surfaces *A* and *B*. Clamping bar *K* on each side of the fixture secures the castings in proper position for machining.

The machining cycle was started by placing one casting in a vertical position for milling surface *A*. It was then placed on the opposite end of the fixture for milling surface *B*, and while this cut was in progress, a second casting was mounted in the vertical position. From this point on, the fixture was indexed for milling the surfaces on the castings until the entire lot was completed. Since all handling of the castings was done during the machining cycle, the quantity output was doubled over that when individual fixtures were used for milling the two surfaces.



The heel block on this clamp offsets the clamping pressure and prevents the jaw from tilting. A compression spring retracts the jaw

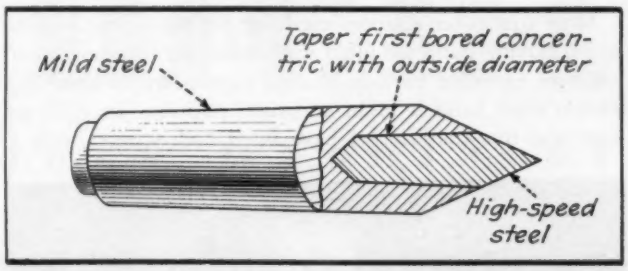
Quick-Acting Clamp for Fixtures

BY EDWARD LAY

The clamp shown in the drawing is applicable to almost any type of jig or fixture. It is quick acting, and requires little space. Body *A* is recessed for compression spring *B*, and slides in a hole in the fixture. Clamping pressure is applied by hollow-head screw *C*, and is released by spring *B* when the screw is loosened. Heel *D* offsets the thrust of the clamping pressure at the jaw, which tends to tilt body *A*, and it must be used when clamping thick workpieces. If the work is thin, heel block *D* can be omitted. Corner *E* of the clamp is cut to a long radius so that body *A* can be swung at right angles to the workpiece when placing the latter in the fixture.

Lathe Centers With Mild-Steel Shanks

BY JOHN J. O'WRIL



Broken drills, taps and other small tools are ground to form hard points that are press fitted into mild steel shanks of lathe centers

Regardless of stressing the importance of adequate lubrication and proper pressures for tailstock centers, our trainess managed to burn and break them at excessive rates. Since replacements were difficult to obtain, we bored and reamed mild steel shanks and fitted them with tapered high-speed steel inserts. A thin channel was ground on the long tapered end of the insert to serve as an air-escape hole when pressing it into the shank. After press fitting, the point of the center was ground to 60 deg. We have been grinding broken reamers, taps and drills to make these inserts, thus reclaiming tool steel that otherwise would be scrapped.

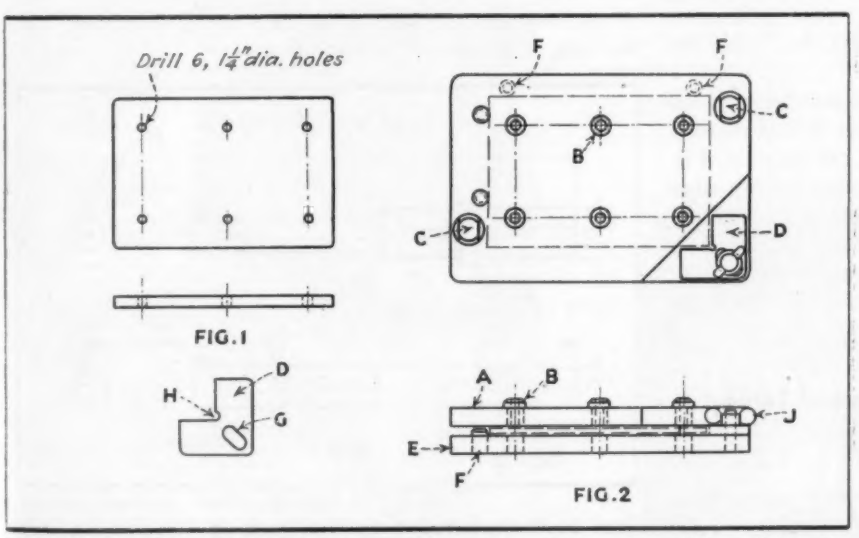
Adjustable Jig for Drilling Rough-Cut Plate

BY ALEX GEORGE

In jig drilling boiler plate or similar rough-cut plate, two problems are usually encountered: One is to take care of the variation in the length and width of the rough plates, and the other is to locate them properly. The latter is difficult because the corners of the plate are not always square. An example of such a part is shown in Fig. 1.

A drill jig that overcomes these difficulties is shown in Fig. 2. Top plate *A*, made from machine steel, holds six press-fitted drill bushings *B*, and has two holes drilled at the corners to accommodate guide pins *C*. One corner of plate *A* is cut away so that the operator may observe the position of locator *D* against the work piece.

Bottom plate *E* locates the part in the jig, and has four ¼-in. pins *F* against which two sides of the rough boiler plate is positioned. Top plate *A* is then applied, and is lined up by pins *C* which are relieved at the sides to prevent plate *A* from jamming. Locator plate *D*, which is adjustable through slot *G* and is relieved at corner *H* so its edges will bear against the sides of the boiler plate, is used to force the boiler plate against pins *F*. When the plate is thus located, thumbscrew *J* is tightened. The boiler plate can then be drilled, with chips escaping through holes in plate *E*.

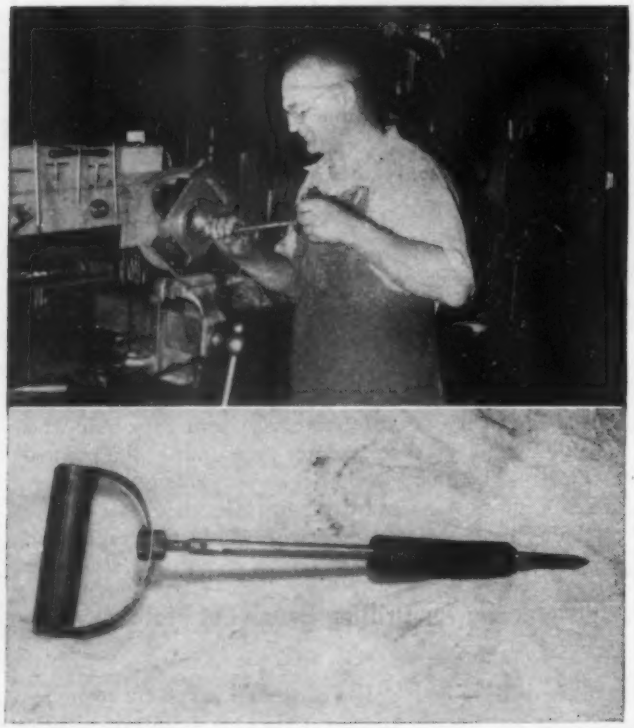


This jig is used to drill boiler plate with slight variations in width and length and corners not exactly square

Spade-Type Scraper Handle Minimizes Fatigue

BY G. R. SIEGER
Gallmeyer & Livingston Corporation

Most triangular scrapers used for finishing bored holes and removing burrs are fitted with wood file handles. Their use over extended periods of time causes fatigue since the worker's left hand is in an unnatural position. In order to overcome this condition, I have fitted each scraper with a



The spade-type handle on this triangular scraper minimizes fatigue when finishing bored holes and bearings. The handle can be turned on the shank to bring another cutting edge into position

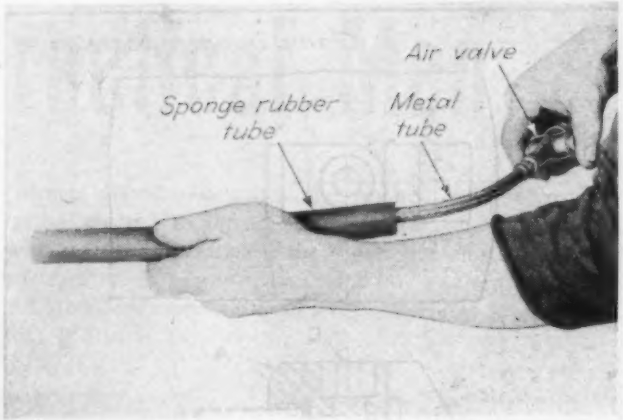
"spade" handle so tilted in relation to the axis of the scraper body that the worker's hand is always in a natural position. This handle is made of strip steel bent in a U-shape and drilled at each end for a rivet that holds the wood handle in place.

The bent piece of strip steel is drilled for clearance on the threaded end of the scraper shank, and is held thereon by two jam nuts. Thus the scraper head can be rotated in relation to the handle so as to bring another cutting edge into position without necessitating a change in the position of the worker's hand. A wood cylinder drilled longitudinally for clearance over the scraper shank permits turning the scraper with left hand while it is supported by the right hand without fatigue.

Compressed Air Helps Assemble Hose and Tubing

BY S. SPINK
Westinghouse Electric & Manufacturing Company

Difficulty is often encountered in slipping rubber hose over metal pipe or tubing when the inside diameter of the hose is smaller than the outside diameter of the metal tubing. This problem can be simplified by connecting one



Small diameter hose can be applied easily over flexible tubing with the aid of compressed air. The hose is squeezed and expands as air escapes along the tube

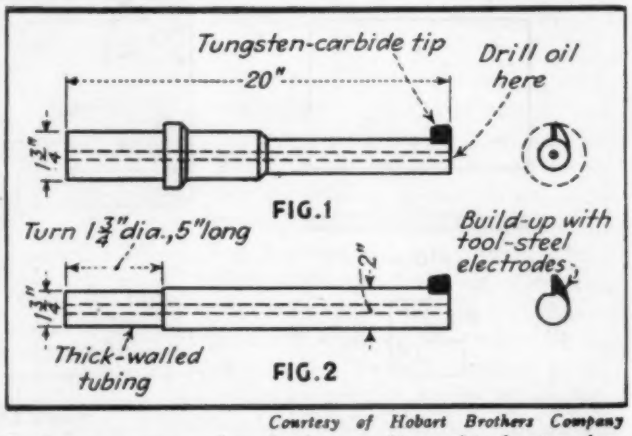
end of the metal tube to a low-pressure air line, and then pinch the rubber hose after the tubing is entered into it. This controls the rate at which the air escapes through the hose, and causes the air to back up and escape through the space between the hose and the tubing. When the air escapes in this manner, the hose is expanded, and it is a simple matter to push the metal tube through it. Before this practice was adopted, it was necessary to split the hose, and tape it after inserting the metal tube.

Boring Bar Redesigned for Welding

BY R. W. CRIPE

The tool shown in Fig. 1, machined from bar stock, is used to bore airplane landing gear struts. It has been replaced by the boring bar shown in Fig. 2, which is made for 2-in. thick-walled tubing. The latter design was adopted to eliminate machining the outside diameter and drilling the oil hole. The cutting tip of the new bar is built up by arc welding, using tool-steel electrodes.

The cost of the boring bar shown in Fig. 1 is approximately $100, while the one in Fig. 2 costs $20. Its adoption saved approximately 15 lb. of metal, 8 man-hours and 6 machine-hours. Other tools have been redesigned for welding, with similar reduction in costs.



Courtesy of Hobart Brothers Company

Tool costs were reduced when making this boring bar by substituting thick-walled tubing for turned and drilled bar stock

Armament

SECTION OF AMERICAN MACHINIST

To suit a woman's strength, the 50-lb. cylinder barrel is now removed from the conveyor with a wheeled carriage that tilts the part to the correct angle for inspection of the bore

A U-shaped hook simplifies loading the cylinder barrel into a Bryant grinder

Teaming Handling Devices With Women

BY H. E. LINSLEY,
Wright Aeronautical Corporation

To clear the telescoping overarm peculiar to the Bryant grinder, the U-hook is also provided with a pivoting C-hook connection to the rope hoist

A double-purpose wheeled carriage is placed on the conveyor taking barrels away from the first machining line. First function is to lift the part off the pallet for gaging the bore; second function, to position the barrel horizontally for the take-away conveyor hook

If the strain of lifting heavy parts is removed by provision of properly designed mechanical devices, women can take over many of the war plant jobs formerly beyond their strength

MANY PARTS of the modern aircraft engine present handling difficulties despite achievement of an extremely low weight to power ratio for the engine as a whole. Wright Aeronautical Corporation found, for example, that many jobs were being confined to men because of the weight-lifting factor. Company policy is directed toward the employment of women wherever possible, in order to release three men per unit to more critical jobs or the armed services. Any barrier to this program is being removed as rapidly as possible. And so it is that considerable study has already been given to development of work-handling devices that will permit employment of women on jobs formerly beyond their strength or unsuited to their physical attributes.

The designing of these devices is an additional function of a special group known as Work-Flow Engineering, which is normally responsible for the design and installation of all conveyors, trucking systems, cranes, hoisting apparatus and other equipment for maintaining a smooth, steady flow of work in process through the shop. Ideas for these labor-saving devices originate in most cases from the observations of the group, but to an increasing extent they are being developed from suggestions made by supervisors and workers.

Inspection of Cyclone cylinder barrels for tool marks and scratches after the first machining operations requires removing the part from the conveyor, tilting it for proper light reflection and rotating the piece for examination of the entire bore. Since the barrels at this stage weigh some 50 lb. apiece, their continual handling is beyond the strength of a woman. A tilting carriage solved the difficulty. Of welded construction and built chiefly of angle iron, the carriage consists of a small wheeled platform carrying a hinged fork. Rails are attached to the edge of the conveyor at the proper height, and wheel flanges and guard rails prevent possibility of accident. In operation, the carriage is pushed to its extreme forward position, and the part is tilted backwards. This causes the forked arm to lift until rollers mounted on the ends of the arms engage the flange of the part, raise it clear of the conveyor, and carry it back onto two pairs of roller supports. The carriage is next pulled back, carrying the part at a convenient angle to the inspection position. After inspection the

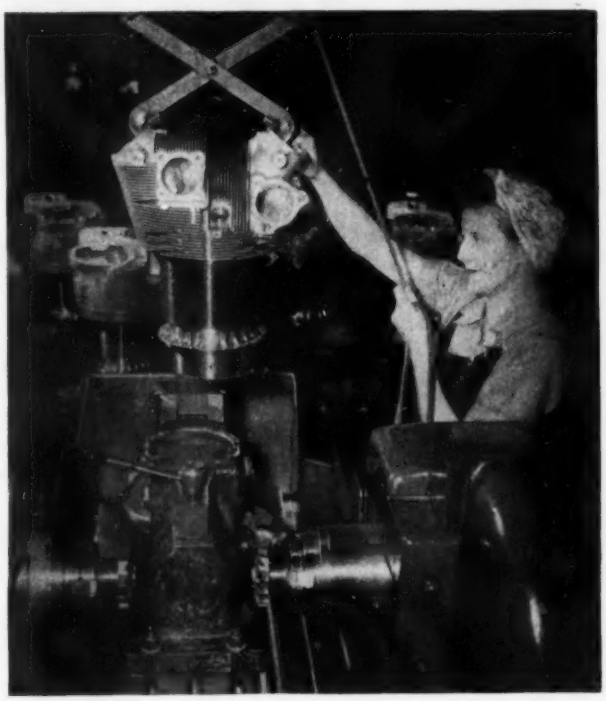
carriage is again pushed to the edge of the conveyor and the barrel is tipped forward onto its pallet.

After tin plating, the cylinder bore is ground on a Bryant grinder. Here the problem of lifting the heavy barrel into the machine has been met by the use of a small hoist carried on a jib crane. Arriving at the machine in a vertical position, the barrels are tipped sideways onto a work table and one leg of a narrow U-shaped hook is inserted in the bore. The outside leg is pivoted to one end of a large C-hook whose other end is carried on the crane hook. By means of the hoist the part is then raised to the proper height for insertion in the machine, where it is gripped on the outside diameter below the flange and the hook is withdrawn. The large C-hook encircles the telescopic overarm peculiar to this type of grinder, eliminating the interference to a straight sling. Removal of the part is performed in the same way, the U-hooks being equipped with rubber strips to avoid marring the finished surface.

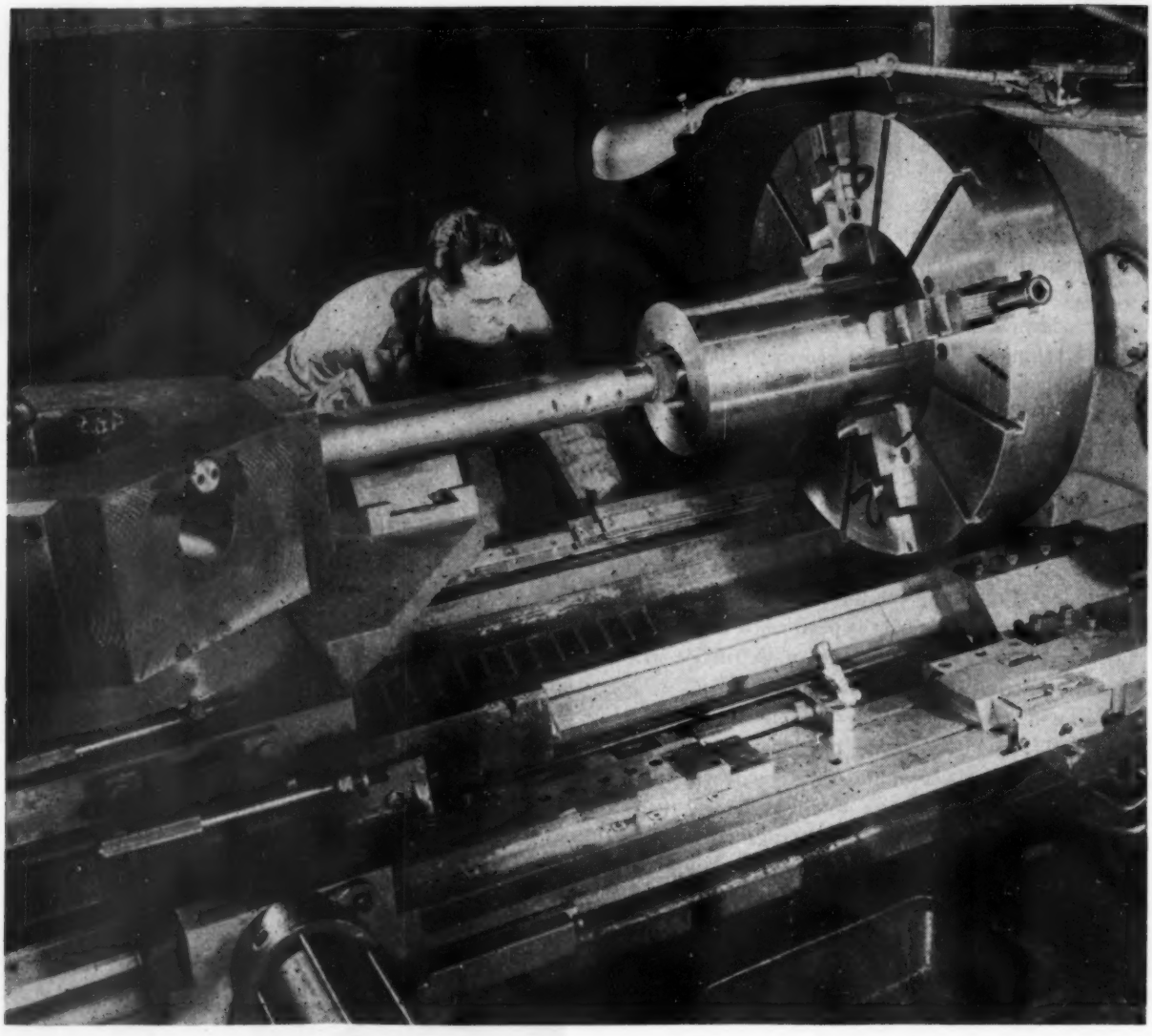
Following this operation, the cylinder bores are inspected for size before the parts pass to the heat-treat department via an overhead conveyor. The transfer from one conveyor to the other is effected by a simple mechanism. This is again of welded construction and consists chiefly of bar and angle iron, and is carried on wheels running directly on the side rails of the roller conveyor. This arrangement enables the operator to run the transfer device up to the end of a waiting line of barrels, rather than wait until the parts are pushed down to her. To operate this device the inspector first disengages the handle from its stop, and raises it slightly. This action lowers the edge of the carrier and permits the cylinder barrel to be pulled into position. Pressing down the handle to the first stop lifts the part clear of its pallet and holds it firmly during the gaging procedure. The wooden pallet, meanwhile, slides under the fixture and returns to its point of origin. After inspection, the inspector again depresses the handle, raising the supporting cradle and permitting the part to swing into a horizontal position at exactly the right height for the rubber-covered hook of the chain conveyor to enter the bore and transport the part to the heat-treat room.

After the cylinder head and barrel have been assembled into a unit, several operations must be performed. Among them is the milling of two flats on the barrel flange. The actual milling time is short but loading and unloading presented considerable difficulty until the adoption of an ice tongs grab. These tongs are shaped at their lower ends to fit inside the cylinder-head rocker boxes.

Manipulation of the carriage handle causes a linkage to turn the gaged barrel to the horizontal position, so that a rubber-covered conveyor hook can enter the bore and take the part away to the heat-treating department in another part of the plant



"Ice tongs" suspended from a hoist make it an easy matter for a woman operator to lift the cylinder assembly in and out of a milling machine



Chevrolet Finds New Ways

CHAMBERING THE 90-MM. GUN

New Way

An expensive two-bladed wood-packed reamer is customarily forced into the chamber of the gun tube. Often the chamber is scored, necessitating reworking or scraping. The operation requires 16 man-hours per gun tube and the tool must be reworked after each chambering operation.

Old Way

An air-driven grinding spindle was designed by Chevrolet and built into a turret lathe. A profiling attachment was also devised to guide the wheel along the proper path. The chambering operation is now performed in 8 hours or less, and danger of damage to the tube is minimized.

Results

Time savings.....50 percent

Inexpensive tool maintenance

AIRCRAFT PISTON GRINDING

Old Way

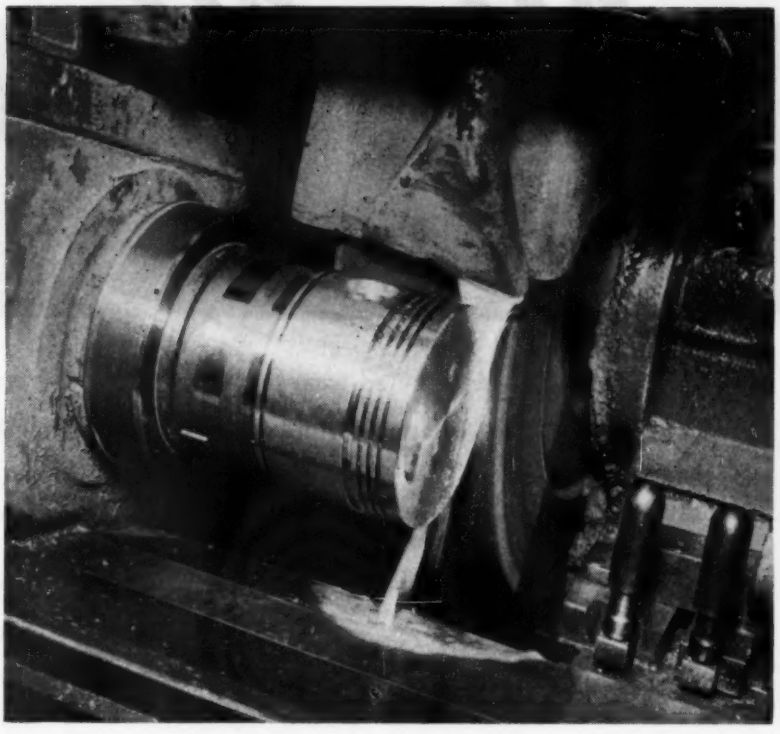
In the common method, five diameters of the Pratt & Whitney aluminum piston are plunge ground separately, blending taper and radii. Thus, five set-ups, handlings and stock movements are required.

New Way

A cam dressing attachment devised by Chevrolet permits form plunge grinding the five diameters at once, and a perfect blend on all diameters is obtained.

Results

Labor saving.....80 percent
Fewer machines and wheels



TAPPING P. & W. POWER SECTION

Old Way

Special fixtures were mounted on three single-spindle tapping machines for tapping 224 cylinder mounting holes in the three power section components.

New Way

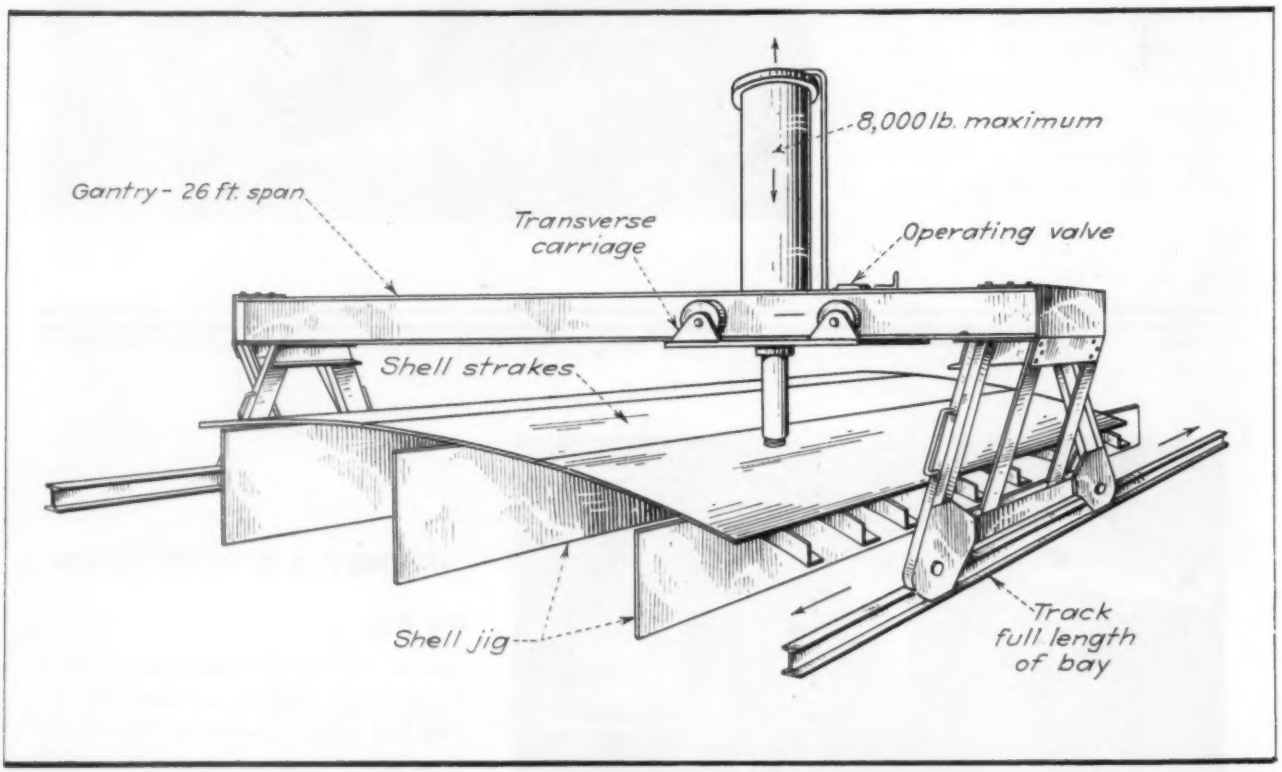
The three crankcase sections are now bolted together and tapped on a 16 spindle machine, using a new fixture. The machine is equipped with an automatic coolant system and an automatic chip blower.

Results

Production increase.....500 percent
Manpower saving....two men per shift
Coolant recovery....200 gal. per month

War Winning SUGGESTIONS

The following ideas were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to its war production.



Saves 6,000 Hours When Welding Shell Frames

When welding shell plates to shell frames during the construction of ships, it is customary practice to weld saddle clips over the frames and onto the plates, and then pull the plates to the frames with wedges. This practice has been discarded in favor of the pneumatic plate pusher shown in the drawing.

The pneumatic cylinder, with a ram capable of exerting a maximum pressure of 8,000 lb., is mounted on a carriage which travels transversely and spans the entire width of the frame jig. The carriage in turn is mounted on a gantry that travels the full length of the assembly bay. Both the cylinder carriage and the gantry are manually operated. The stroke of the ram is such that it reaches the highest and lowest points of any shell-frame assembly.

Two of these pushers have already been installed, and each reduces by 50 percent the number of man-hours required to weld the shell plates when compared to the saddle-and-wedge method. Total savings amount to 6,000 man-hours each month. *Suggested by William Davies, Kaiser Company, Inc.*

Driving Dog Prevents Damage to Gear Shafts

A standard driving dog is generally used when grinding gear shafts as shown in Fig. 1. However, where surfaces must be ground on both ends of the shaft, as shown in Fig. 2, it is necessary to attach this dog to the finished end when reversing the part in the machine. In spite of bronze shim stock placed between the setscrew and the part, damage to the finished end is likely to occur in obtaining sufficient tightness. Such damage can be prevented by using the dog shown in Fig. 3. The squared end of this dog fits into a slot in the driving plate and

is tightened in place by a nut on the threaded portion. The tang which fits between the gear teeth is made of bronze, so as not to mar the surface, and is brazed to the steel shank. Once this dog is fixed in the machine, it remains in place. The finished gear shaft is removed by backing out the footstock center and pulling it off the headstock center without disturbing the dog. In comparison, the old-type dog had to be removed and attached twice for each part.

Production has increased from 25 to 50 gear shafts per shift through the use of the dog shown in Fig. 3. Furthermore, reclamation of finished shafts marred by the setscrew on the old-type dog has been eliminated. *Suggested by Clarence Wasilewski, Aircraft Engine Division, Packard Motor Car Company.*

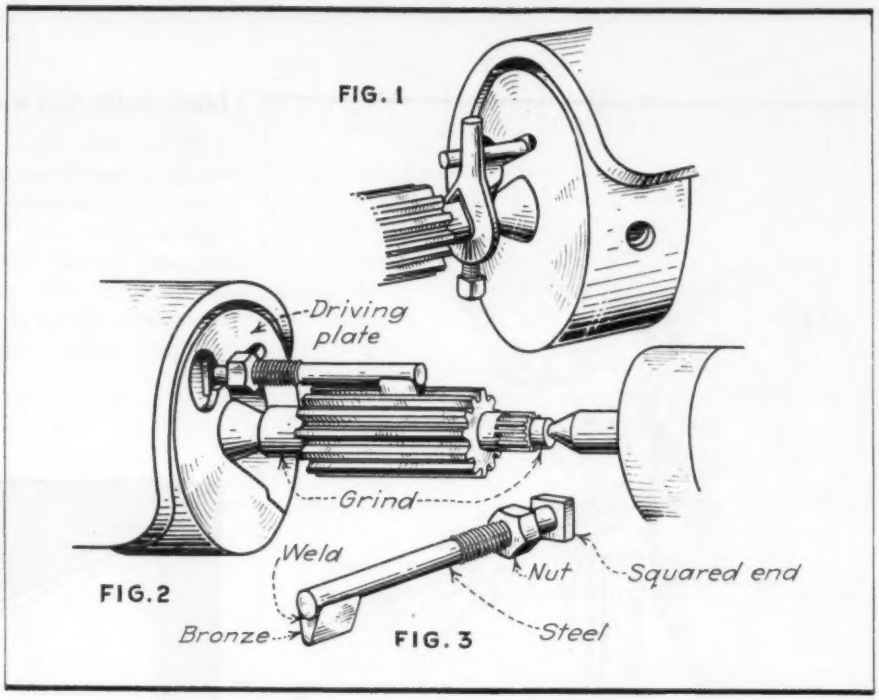


FIG. 1

FIG. 2

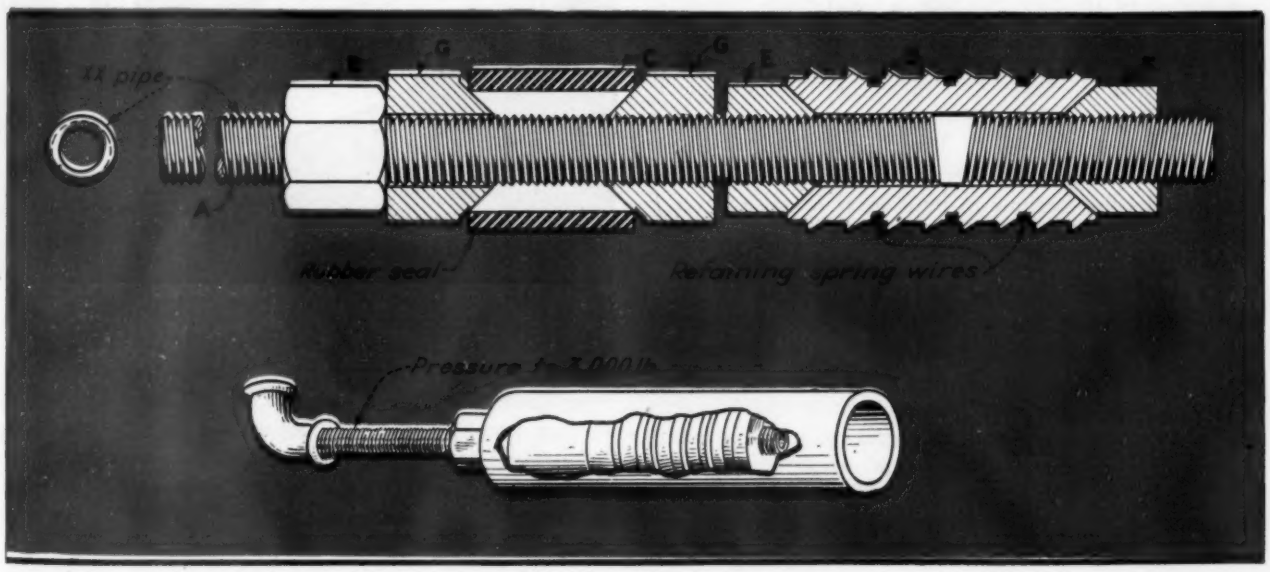
FIG. 3

Expanding Plug Seals Pipes for Pressure Tests

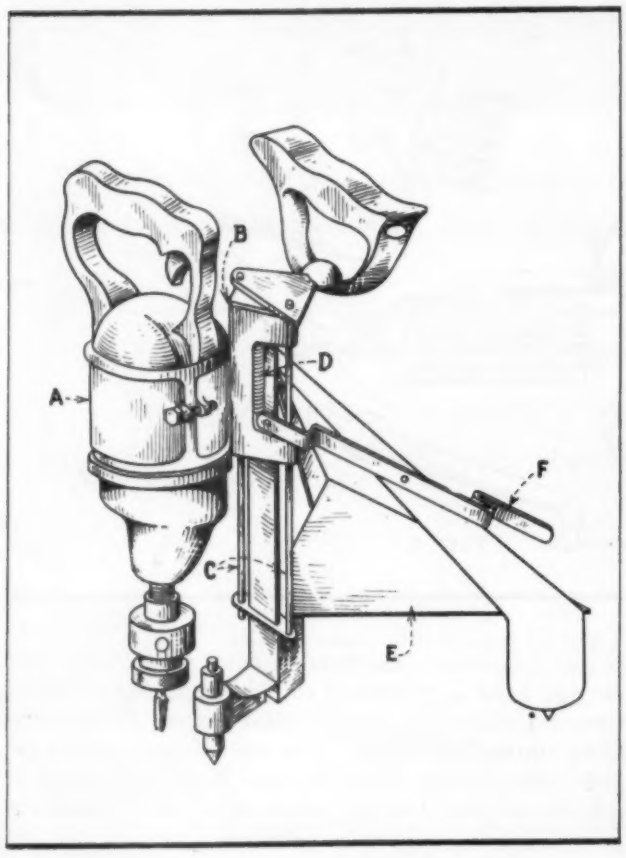
Many pipes are tested hydrostatically before final assembly by welding, in which case it is not feasible to thread the pipe for heavy caps or other fittings. The expanding plug shown in the drawing was devised to eliminate the use of such fittings.

The expanding plug consists of threaded double-strength pipe *A*, expanding grip *B*, rubber seal *C*, and jam nut *D*, The expanding grip is made up in segments and held together by spring retaining wires. After the plug is inserted in the pipe to be tested, pipe *A* is turned to expand grips *B* against the interior walls, this being accomplished by pulling tapered nuts *E* and *F* toward each other on right-hand and left-hand threads, respectively. When tightened, rubber seal *C* is expanded between sliding cones *G* by turning Jam nut *D*. This seal effectively closes the pipe against leakage during the test. Right-hand cone *G* is threaded on pipe *A* so that rubber seal *C* can be positioned as desired in the pipe to be tested.

This plug can be used to seal pipe tested hydrostatically up to pressures of 3,000 lb. per sq. in. It can also be used to recondition and straighten copper and brass pipe under pressure. *Suggested by Perham M. Wood, Marinship Corporation.*



★ WAR WINNING SUGGESTIONS ★



Non-Skid Machine Taps Holes in Flat Plates

The illustrated tapping machine was designed for threading countersunk holes in cargo-ship deck and floor plates. These holes were tapped previously with an unsupported air motor.

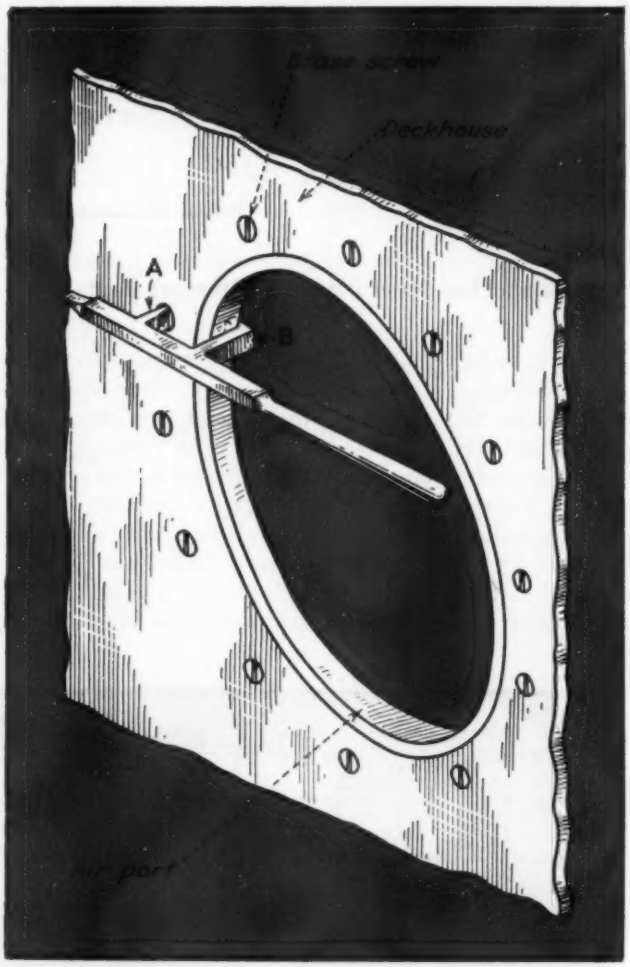
Motor *A* of the new machine is clamped to bracket *B* that slides vertically on perpendicular guides *C* mounted on a tripod, the legs of which are fitted with center points. Spring *D* within bracket *B* is in tension while a hole is being tapped, thereby facilitating the removal of the tap when the motor is reversed. Once the machine is located above a drilled hole, the operator stands on step *E*. His weight holds the machine in position as he raises lever *F* to start the tap into the hole. The auxiliary handle fitted to the tripod facilitates the operation of the device.

The center points on the tripod legs keep the machine from slipping on the smooth deck plates. A hole can be tapped much quicker than when an air motor is handled individually by a mechanic; furthermore, the holes will be tapped straight, keeping the heads of countersunk screws flush with the plates. Also, tap breakage has been eliminated. The machine has effected a saving of 672 man-hours daily in the construction of C-2 cargo vessels. *Suggested by Byron M. Johnson, Oregon Shipbuilding Corporation.*

Lever Holds Screws When Tightening Nuts

When setting brass screws that hold frame rings in deckhouse airport openings of C-2 cargo ships, a common or lever-type screwdriver was used to hold the screws while tightening the nuts. Quite frequently, due to severe torque imposed on the screw, the screwdriver would back out of the head slot, damaging the head so severely that replacement of the screw would be necessary. Such damage is now prevented through the use of the illustrated screw holder.

Spur *A* on the lever enters the head slot of the screw



and hook *B* passes through the port opening to engage the opposite surface of the bulkhead. Manual pressure on the lever causes the hook to act as a fulcrum, thereby forcibly holding spur *A* in the head slot on the screw. This device has reduced spoilage of screws 35 percent. The handle of this tool is pointed to start screws, eliminating the need for a special screwdriver. *Suggested by J. Candray, Permanente Metals Corporation.*

AMERICAN MACHINIST REFERENCE BOOK SHEET

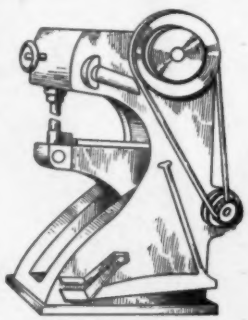
Methods for Forming Aircraft Sheet Metal—I

Courtesy Douglas Aircraft Company

In order to design aircraft sheet metal parts with a view toward ease and economy of production, one must understand the machine selected to produce the part—its capabilities, limitations, efficiency in relation to other machines that might be used for the same purpose. These pages on forming of aircraft sheet metal follow the method of presentation employed for a previous series on "Methods for Cutting Aircraft Sheet Metal."

Parts formed from hard stock, 24STAL aluminum alloy, exhibit superior physical properties and corrosion resistance, and have certain manufacturing advantages as compared to pieces made from soft stock. Most hard stock fabrication is performed on power brakes, stretcher presses and roll forming machines at present.

SHRINKING MACHINE



An aid to hand forming

Machine Efficiency

A=Excellent, B=Good, C=Fair, D=Poor

Number of Parts	Cost	Speed	Accuracy
1-5	A	A	C
5-50	A	A	C
50-500	B	B	C
500 & Up	C	C	C

NOTES:
Die cost—none
Set-up cost—none
Operating cost—moderate

Materials Formed

All commonly used metals may be formed on this machine, including lighter gages of stainless steel.

Design Considerations

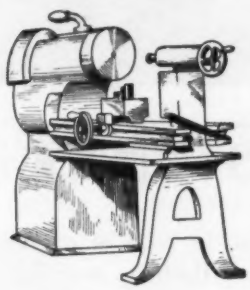
Parts are never designed to be formed on the shrinking machine. This machine is used only as an aid to hand-forming.

Limitations

Minimum flange radius, ¾ in.

It is impossible to form all parts on a shrinking machine because it is a reworked punch press and may interfere with larger parts when shrinking certain areas.

SPINNING



Forming a sheet of metal into revolute shapes

Machine Efficiency

A=Excellent, B=Good, C=Fair, D=Poor

Number of Parts	Cost	Speed	Accuracy
1-5	A	A	B
5-50	A	A	B
50-500	A	A	B
500 & Up	C	C	B

NOTES:
Tool cost—moderate, but dependent upon the shape of the part
Set-up cost—small
Operating cost—moderate

Materials Formed

Aluminum (2SO, 3SO) is the best material for spinning.

Aluminum Alloy:

Soft stock (24SO, 24SOAL) spins well, although it may have to be annealed during the operation. Alclad will not rub off except in very severe spinning.

Hard stock (24ST, 24STAL) has not been spun successfully.

Magnesium alloy will probably form if heated to 400-500 F. during the forming operation.

Corrosion-resisting steel work-hardens rapidly, but lighter gages in the annealed condition may be formed by reannealing during the spinning process.

Design Considerations

1. Parts which lock on the die may be formed only on collapsible tools, which are considerably more expensive than a regular die.

2. Hard stock should never be specified.

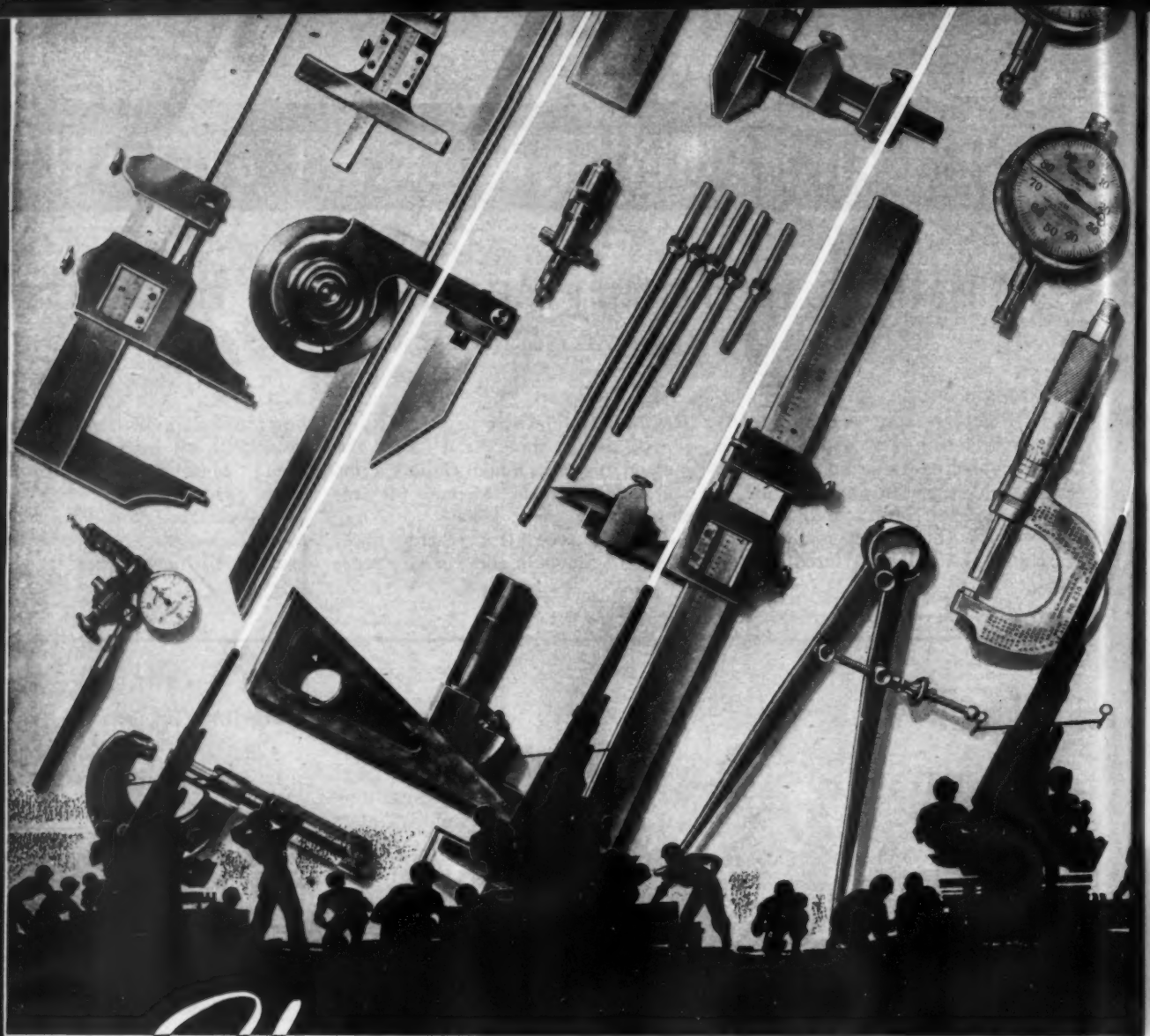
3. Dimensions on spun parts should always be given to the concave side so they can be applied directly in making the spinning block.

4. Accuracy of finished parts is possible and close tolerances can be held, although widest tolerances consistent with usage of part should be specified.

Limitations

No size limitations are involved, except the swing of a given machine.

STARRETT TOOLS



The SAME AIM...

Starrett Tools and the tools of war they're helping to make have many characteristics in common. Both are built for accurate, dependable performance under strenuous service conditions. Both are designed to supplement and sustain the skill and efficiency of their users—to help maintain the morale that hastens victory.

The makers and the distributors of Starrett Tools are acutely conscious of the importance of providing the tools essential for war production and the qualities in these tools that users rely upon to help them meet production schedules and precision standards.

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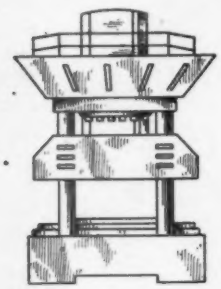
AMERICAN MACHINIST REFERENCE BOOK SHEET

Methods for Forming Aircraft Sheet Metal—II

HYDRO-PRESS



Although capable of shearing lighter metal, the Hydro-Press is primarily a stretching and bending machine. It is adaptable to forming beads, flanges, lightening holes and similar shapes from sheet metal

Machine Efficiency

A=Excellent, B=Good, C=Fair, D=Poor

Number of Parts	Cost	Speed	Accuracy
1-5	B	B	B
5-50	A	A	B
50-500	A	A	B
500 & Up	A	A	B

NOTES:
Die cost—low
Set-up cost—extremely low
Operating cost—low
Flexibility—very good

Materials Formed

1. Aluminum (2SO, SO) has excellent forming characteristics, no appreciable springback, and is good for complicated draws.

2. Aluminum alloy — Soft stock (24SO, 24SOAL) has good forming characteristics, although it will elongate less than aluminum. Hard stock (24ST, 24STAL) is preferable because it eliminates the heat-treating operation. An objection is that greater pressure is needed, and excess springback causes the part to warp. Accordingly, only certain parts can, at present, be made from hard stock.

3. Magnesium alloy (MA, MH, AM3SO, AM3SH) has the same general characteristics as soft stock when formed on a hot plate.

4. Corrosion-resisting steel (18-8) has good forming characteristics in annealed and in ¼ hard condition in lighter gages. It is impossible to form full-hard metal because of insufficient pressure.

Design Considerations

In designing for the Hydro-Press, the main problems are:

A. To form the part without splitting or wrinkling.

B. To form the part properly in one stroke without hand malleting.

To insure this, the following suggestions are given:

1. Design for open flanges rather than closed flanges.
2. Design for simple flanges rather than "C" flanges.
3. Use channel sections rather than "Z" sections.
4. Locate beads on same side as flanges. In general, female bead dies form better than male bead dies.
5. Form lightening holes in same direction as flanges. Exception: Where closed flanges have to be used, specify "direction of lightening hole optional."

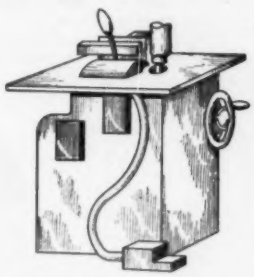
Limitations

2,000-ton press (SM)—36x96-in. table
Rubber thickness, 6 in.
Max. formed height of part, 3 in.

5,000-ton press (SM)—50x168-in. table
Rubber thickness, 10 in.
Max. formed height of part (depends on method of loading and type of die), 8-10 in.

2,500-ton press (LB)—36x96-in. table
Rubber thickness, 10 in.
Max. formed height of part, 8-10 in.

FLANGING MACHINE



Forms straight "C" flanges on all radii

Machine Efficiency

A=Excellent, B=Good, C=Fair, D=Poor

Number of Parts	Cost	Speed	Accuracy
1-5	A	B	B
5-50	B	A	B
50-500	B	B	B
500 & Up	D	C	B

NOTES:
Die cost—none
Set-up cost—moderate
Operating cost—moderate

Materials Formed

All sheet metals can be formed on flanging machines within their limiting bend radii.

Design Considerations

1. Flanging machine used mainly for "C" flanges which have been partly formed on Hydro-Press.
2. Used also to bead wire.
3. Machine actually an aid to hand forming of flanges which cannot be formed otherwise.

Limitations

Individual tools control limits of flanging machine.

(To be continued in an early number)

Headache Cure.....

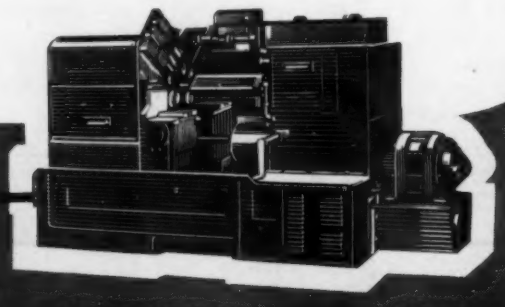
ARMY E NAVY

● The outstanding thing about a New Britain Automatic is its unmatched ability to stay on the job. Every feature, every detail of engineering and construction is built with this paramount thought. Even the famous high speed of these machines is secondary to continued, trouble-free production.

NEW BRITAIN AUTOMATICS

GET ON THE JOB • IN WAR OR PEACE

NEW BRITAIN-GRIDLEY MACHINE DIVISION · THE NEW BRITAIN MACHINE COMPANY · NEW BRITAIN, CONN.



A Job Yet To Be Done

THERE HAS BEEN a noticeable tendency in Washington to regard the machine tool industry as finished with its war job.

People in high places have commented, publicly and privately, on the fact that our war plants are now tooled up for the tasks assigned them and little more remains for the machine tool people to do.

Whereas for two years or more the pressure was to get out more and more machine tools, the emphasis today is in exactly the opposite direction.

Rules have been clamped down so tightly by the War Production Board that it is next to impossible for a contractor to secure a machine tool unless he is tooling up for a new war assignment.

This tendency toward extreme caution is commendable in that materials and manpower should be conserved whenever possible. To build machines for which no real need exists would be to waste our natural and our human resources.

Washington officials in their zeal, however, should not lose sight of a vital factor. New machine tools, installed in the proper places in the months ahead, can do much to aid in relieving the critical manpower situation.

We have found that our supply of manpower in this country is not unlimited, hence we must make the very best use of it. One effective way of doing this is to see that we get the highest possible output per manhour in our war factories.

There are many, many spots where that can best be done by replacing a relatively low production tool with a high production machine.

When we had to tool up our industries with speed as our prime objective, thousands of older machines were pressed into service so that we could begin to produce quickly.

Time was of the essence, and immediate output of goods rather than low cost and top efficiency was all-important.

But today the emphasis has shifted. We must, in effect, ration our manpower against our various needs for the armed services and for our war factories.

Now is the time, therefore, to get the highest war production yield per man employed.

That objective cannot be accomplished so long as out-moded machines are doing the work that can be done with the greatest efficiency and with the maximum conservation of manpower only by new and up-to-date machine tools.

Any rule by WPB or by any other government agency that blocks the road toward that objective or that even partially obstructs it should immediately be modified or eliminated.

Our ability to achieve ever higher levels of output per manhour should be encouraged. Only in that way can we and our allies overwhelm the enemy in the shortest time with a preponderance of materiel and of men.

Burnham Finney

Gaging Business

With airplane output this month passing the 8000 mark for the first time, war production is causing fewer headaches than during the summer. Manpower is the major concern. In one vital area only 60% of the necessary labor is at hand. Other critical spots report tight labor conditions.

Washington is trying to do something about seeing that available manpower is used to the best advantage. Aircraft and shipbuilding industries are said to be less efficient than other war industries in employment of labor.

The so-called Buffalo Plan of labor priorities in war plants is now operating in nine local regions, five of them on the West Coast. War agencies are trying to avoid the placing of further orders in critical regions and are continuing to cancel orders wherever the situation is bad and wherever the same work can be done elsewhere with satisfactory results. Latest cancellation is a landing mat contract on the Pacific Coast.

Recent serious changes in aircraft design are about at an end, thus eliminating for the moment one deterrent to production. Schedules of trainer and transport planes and some small types of fighters are being cut again. Large bombers and fighter-bombers will get more attention. Use of stripped but heavily armed fortresses as fighter protection to other bombers in recent European raids may be a tip-off on future long-range bombing strategy.

Army and Navy ordnance output is reaching the goals set for it, but certain programs still are being cut back. Ample stocks are being built up at strategic centers.

Pressure is being put on small diesel engine production, mostly for invasion barges. Plans call for doubling current operations. One of the biggest programs outside aircraft is for manufacture of huge numbers of heavy-duty trucks.

Aluminum, magnesium, copper and molybdenum are all easier. Fabricating bottlenecks hamper the availability of aluminum and magnesium in desired forms and shapes because of manpower shortages. Enough copper is in sight that the Army has dropped the bulk of its program for making shell casings out of steel.

Steel looks so bright for 1944 that WPB is debating whether to curtail production next year or to make available for civilian consumption the prospective excess over war needs. Worst spot in carbon steel is in flat-rolled. Reason is the dovetailing of requirements for drum stock, landing barges and tinplate for canning, on top of increased plate demands for merchant ships in particular.

Machine tool production was surprisingly good in September, preliminary estimates placing it at $85,000,000 compared with $87,000,000 in August. Total shipments this year should exceed $1,100,000,000, not far from the all-time high in 1942. Machine tool needs of all agencies next year, including lend-lease, are estimated at $325,000,000, compared with an all-time high of $1,360,000,000 in 1942. The French government in North Africa is asking for machine tools to produce munitions for the French army.

Pool orders for machine tools shortly will be exhausted, but a new pool plan is likely to be set up, based on the anticipated reduced volume next year, with limited quotas for individual companies. Such a plan would give some protection against cancellations of orders.

Liquidation of Surplus Equipment Seen as Slow and Involved

With industry groggy from renegotiation and taxes, and restricted from direct purchases of equipment at advantageous prices, the surplus is apt to linger around

WASHINGTON—The attempt of WPB's Redistribution Division to liquidate about $1,000,000,000 worth of used equipment and machinery, mostly owned by Federal Agencies, is regarded as one of the most difficult tasks facing any government agency. Observers believe that there is little chance that more than a small part of the total can be sold at reasonable prices, indicating that the balance would remain as a Sword of Damocles hanging over the head of industry for perhaps five to ten years disrupting markets and prices for new equipment and machinery. As a result, some WPB officials have been considering the idea of holding the bulk of this equipment off the market, except for the orderly liquidation of about 10 percent or so of the total yearly depending upon how much could be absorbed by industry.

Right now, the Redistribution Division is circularizing its regional offices and 4,400 licensed used equipment dealers with listings of these items. Of the total, some $200,000,000 is owned by dealers, about $90,000,000 is owned by the Defense Plant Corp., $120,000,000 is owned by Treasury Procurement, while the Army has at least $600,000,000 worth, if not as high as $1,000,000,000 in Army-owned items. No idea is at hand regarding the Navy's liquidation job, which is expected to be much smaller than the Army's. In fact, this month the Navy needed some of the 35,000 machine tools released by NYA to equip naval bases abroad.

Just Reaching Market

DPC's and Treasury Procurement's listings of used equipment have been circulated around the country for about three months, but little is believed to have been actually sold. Meanwhile, the Army's listings were only begun about a month ago, so that the full impact of the volume of used material being placed upon the market is only now being felt.

In view of the fact that procedure dictates that these agencies first try to liquidate this surplus within their own jurisdiction for about 20 days before throwing it upon the open market, chances for the speedy sale of this material do not seem too bright. As it is, most war contractors, hard hit by renegotiation and now suffering from cancellations, are poor prospects as potential buyers. Civilian-type industries may thus be more receptive, but not for several months.

Most impressive aspect of this titanic liquidation job right now is that Federal Agencies are being much prompter to unload used surpluses than they were in the last war. Observers recall that most Federal Agencies were still trying to liquidate war surpluses in early 1920, about a year-and-a-half after the war ended, and the surpluses then were much smaller.

Sidelight to this situation is that Congress may investigate the shipment of new machine tools and other equipment under lend-lease instead of trying to ship some of the used items abroad. However, since the huge listings of used items has only been offered for liquidation within the last few months, it is questionable how censorable lend-lease shipments of new items would be. Usually, materials shipped abroad must be stored for months awaiting shipping space, after months involved in the ordering and actual manufacturing of the items. Thus, exports during the third quarter were probably ordered from manufacturers early in 1943 when no large surpluses of used items were on hand.

Hold Prompt Settlement Of Contracts Is Urgent

WASHINGTON — The War Department, the Comptroller General's Office, war contractors, and Congress are agreed that some legislation should be passed as quickly as possible to make possible speedy settlement of contract cancellation claims, but there are certain basic differences among all parties concerned. Nevertheless, observers believe that some legislation, probably in the form of several separate laws, may be passed during December at the earliest, since hearings on two proposed measures, the Murray Bill and the May Bill, end late this month.

Dr. Stanley Teele, Deputy Director of WPB's Procurement Policy Division, believes that contract cancellation will become very serious during the first quarter of 1944, and that a second "wave" probably would accompany the end of the European War, with the balance of cancellations probably occurring prior to the war's end. He points out that thus far about 75% of contract terminations have involved no dollar claims, and that contractors are taking an average of 4½ months time after cancellation before submitting their claims.

Settlement of Claims Drags

Meanwhile, hearings on the Murray Bill brought forth the fact that settlement of contract cancellation claims has sometimes dragged out as long as 16 months, according to an experience of the Hazeltine Electronics Co.; that sub-contractors have not been paid by prime contractors holding cancelled contracts because the prime contractor might be unable to justify such payments with his contracting agency later on, as was the case after tank production at Baldwin Locomotive was cut back; that V-loans are not an entirely satisfactory solution to financing industry's reconversion to peacetime production pending the settlement of claims, since it may take as long as 8 months to secure a V-loan, as happened to Aviation Corp.; that valuable materials involved in cancelled contracts are being tied up and useful plant space is being blocked by such materials pending inventorying by a Federal representative to check cancellation claims. Witnesses testifying at the hearings were unanimous in the belief that lack of a uniform policy on contract termination would delay post-war reconversion, cause unemployment, and probably ruin many small and large companies. The aircraft industry was revealed as being particularly vulnerable because of its large amount of capital invested in inventory.

Prompt Cash Advance

To head off such difficulties, legislation would probably have to provide for a prompt cash advance of from 35% to 75% on cancellation claims, some easy method of preliminary negotiation of such claims without an involved inventorying and checking procedure, a manner for the Federal government being protected against fraud, provision for lumping claims for various cancelled contracts together and making settlement perhaps with a single agency holding the bulk of an individual company's contracts, and finally provision for appeal from such negotiation by the contractor to some local tribunal. Such law or laws would probably provide for speedy settlement of sub-contractors' claims below a certain specified amount.

Industry executives point out that taxes payable to the Federal government in the year after the war might not be paid in many cases if war contractors are unable to settle their cancellation claims within a reasonable time. Moreover, plans for separation pay for war workers could not work unless contractors are aided in re-establishing their cash positions.

N. M. T. B. A. Slogan is "Full Steam Ahead for War"

Annual meeting stresses important production job yet to be done and necessity for converting unused capacity to manufacture of war products other than machine tools

CHICAGO—Featuring a wide range of topics, from renegotiation to postwar planning, the forty-second annual meeting of the National Machine Tool Builders' Association at the Edgewater Beach Hotel Oct. 11-12 proved to be by far the best attended in history. Group meetings, as usual, were one of the high spots of the program.

Speakers hammered home the fact that the machine tool industry must not rest on its laurels, after having done a magnificent job of tooling up American industry for war production, but must still turn out an important volume of machines for the expanded war effort and must convert its unused capacity to making war goods other than machine tools. The industry likewise must be alert to its after-the-war responsibilities, and to that end the association has appointed a postwar committee.

1944 Output At 25 Percent

Machine tool output in 1944 will represent only about one-fourth the peak capacity built up by the industry, stated Walter W. Tangeman, vice-president The Cincinnati Milling Machine Co. and retiring president of the association, in an address on the outlook for machine tools. He stressed that the only course for the industry must be "full steam ahead for war." The foremost task is to continue "to use all of our facilities, and the special skills of our employees, on behalf of the war effort right up to the moment of victory."

Conversion of machine tool making facilities at this late day to direct war work will be fraught with difficulties, said Mr. Tangeman. Pointing out that "excess inventory is of no value to the war effort," he urged builders to get control of their inventories. He advised the industry to try to improve its delivery position and to reduce the processing time of machines to a minimum. He ventured the opinion that a continuing flow of cancellations could not be escaped, because war manufacturing programs would be continually changed and modified by the fluidity of war.

Mr. Tangeman expressed the hope that a plan can be worked out involving the participation of WPB in determining the number of machines required to be built, together with some form of governmental underwriting of inventory. Its intent would be to secure sufficient machine tool production for war purposes and to assure protection against cancellation. Said Mr. Tangeman, "Without pool orders, some simple procedure must be worked out for compensating manufacturers who have put machines in process which were subsequently cancelled."

A cancellation clause meeting the conditions of the machine tool industry must be developed, declared Mr. Tangeman. The industry should have some voice in the disposal of government-owned machine tools. The government should permit adequate reserves to be accumulated against postwar needs. Discussing postwar problems, Mr. Tangeman said that "only insofar as the combination of men, management and machines can turn out more production per manhour, can American industry succeed in meeting the postwar employment goal."

Machine tool builders must not relax their war activities, because they have an important task yet to do in making machine tools and in converting to other war work, said John S. Chafee, Director, Tools Division WPB, in a talk describing the work of his division. He emphasized that conversion to direct war jobs thus far has not been at a rapid enough rate to keep builders fully occupied next year.

New Officers of National Machine Tool Builders' Association

President

JAMES Y. SCOTT,
president, Van Norman Co.

1st Vice President

JOSEPH L. TRECKER
exec. v. pres., Kearney & Trecker Corp.

2nd Vice President

W. P. KIRK
v. pres., Pratt & Whitney Division Niles-Bement Pond

Treasurer

E. BLAKENEY GLEASON
v. pres., Gleason Works

Director

C. N. KIRKPATRICK
pres., Landis Machine Co.

Director

RICHARD E. LeBLOND
pres., R. K. LeBlond Machine Tool Co.

Reports from 228 companies that did 88 percent of the August business in machine tools show that they have on hand $94,000,000 of direct war work and $350,000,000 of machine tool orders. Some 53 percent of the firms have no direct war work at all. The smallest-sized companies have obtained a much greater proportion of the non-machine tool business than the medium-sized and large companies. At present 83 percent of the maximum capacity of builders reporting to the Tools Division is devoted to machine tool manufacture, nine percent to direct war orders and nine percent is idle.

War Work Varied

Some of the work being done by machine tool builders consists of aircraft and aircraft engine and propeller assemblies and parts, steam engine parts, bomb parts, aircraft torpedoes, hydraulic cylinders and pistons, power drives for tanks, gears and gear assemblies, rifle bolts, valves, diesel engine parts, chemical shell, ship steering gears, turbines and turbine parts, and artillery items.

Mr. Chafee asserted that of $1,863,641,000 of machine tool pool orders authorized since Feb. 1, 1941, all have been shipped or assigned on firm orders except $83,000,000, of which $6,000,000 have been completed and are in DPC storage. He urged builders to report completed or nearly completed unassigned machines to the Tools Division so that they may be listed on the available tools list.

Confusions and delays have been caused by the lack of standardization of spindle mounts for chucks, said Mr. Chafee. Industry should not be in a position in which many chucks are available without the necessary interchangeability to employ them where needed. The same situation has applied to collets.

Industry's Post-War Stake

After enumerating some of the problems to be faced in reconverting from war to peacetime production, Frederick V. Geier, president The Cincinnati Milling Machine Co. and member of the association's comittee on postwar planning, posed certain questions that seem to the committee to be of great importance:

1. How many months before industry can reemploy war veterans and displaced war workers, must engineers be made available for design, planning and process-engineering of products for peacetime?

2. How long before the return home of servicemen must orders be placed to design and build machine tools to retool peacetime production?

3. What determination of government policy regarding government-owned plants and equipment must be made before widespread peacetime reemployment is practical once more?

4. Would it be in the national interest to broaden greatly technical skill and training through generally equipping all technical and secondary schools with government surplus equipment?

5. As the armed services make plans to safeguard the future of the nation, through provision for war materiel reserves, and plant reserve facilities, how can we make our experience in this war most helpful to them?

6. What helpful guidance can we gain through a study of the experience in World War I transition from war to peace?

7. In striving for this postwar goal for national employment and production, do machine tool builders realize that they have more to contribute and more to gain than any other group? The most productive machines and cost-cutting methods in history must be developed by us if America is to have jobs for 56,000,000 and production income of $135,000,000,000.

Cancellation Problem Serious

The machine tool industry should press upon Congress and the Administration remedial measures to protect a supplier, like machine tool builders, who rarely enjoys the protection given a prime contractor, declared Tell Berna, general manager of the association, in a discussion of the termination of contracts. He suggested that the standard termination article might well provide that subcontractors may elect to negotiate direct with the contracting officer and make no charge against his customer. Another solution might be to authorize each of the armed services to send an officer to arrange the cancellation of all the PD-3-A orders from that service and its contractors in a certain machine tool plant at one visit, thus relieving customers and contracting officers of much detail.

Support should be given to legislation providing for immediate cash payment, said Mr. Berna. The prompt disposal of parts is also important, as builders cannot hope to hold these parts for an indefinite period.

Machine tool builders cannot continue to accept cancellations "no charge," declared Mr. Berna. They dare not risk being caught when peace comes with large inventories of parts and subassemblies for which there will be little or no market. All the armed services are now reviewing their cancellation procedure. The Army has a new policy; so will the Navy shortly. WPB is working on a "termination article" resembling that of the Army which it hopes will become standard for all branches of the government. If adopted, it is to be inserted in all new contracts and may be substituted at any time in existing contracts.

Mr. Berna suggested caution to builders in taking orders on PD-1-A priorities that are not the direct responsibility of the government. If such an order is cancelled, charges are collected just as they normally would be from the customer who placed the order. Such orders average about $10,000,000 a month. Customers have been printing detailed terms and conditions on their machine tool purchase orders. In sheer self-defense, builders should carefully review these orders before they are accepted.

Subcontract Work Available

Machine tool builders were told about war production work that they can look to for subcontracts by John B. Campbell, director, Production Resources Division, WPB. He emphasized that new equipment can be secured by builders to tool up for such jobs, if existing machines are not suitable.

Government relations of the industry were described to members in an executive session by Ralph E. Flanders, president, Jones & Lamson Machine Co. and chairman of the committee on government relations. An illuminating report on renegotiation was made by A. G. Bryant, vice-president Cleereman Machine Tool Co. and chairman of the sub-committee on renegotiation.

A close-up of the Australian machine tool industry was given by Fred W. McIntyre, vice-president Reed-Prentice Corp., who recently returned from a mission to that country on behalf of the Lend-Lease administration. An article by Mr. McIntyre on this subject will be published in the next issue of American Machinist.

Labor Shortage Expected To Reduce Subcontracting

WASHINGTON — Leading war contractors have been asked to continue the policy of subcontracting work as much work as possible outside critical labor areas, in a letter from Charles E. Wilson, Acting Chairman of the War Production, clarifying the August 7th request of leading government officials that subcontracts be placed where labor is available. Mr. Wilson stated that because of the earlier request some prime contractors have cut their volume of subcontracting in many cases and undertaken to do more work within their own plants. This, stated Mr. Wilson, "does not relieve the local labor supply situation, may make certain plants idle, and disrupt community transportation and housing.

While Mr. Wilson stressed that "the general policy of effecting as much subcontracting as possible still stands," sources here believe that the overall volume of sub-contracts may decline due to labor shortage.

Tool Engineers Discuss Improved Production Methods

Indianapolis meeting is devoted to consideration of wartime developments which have increased output or improved the quality of the product

INDIANAPOLIS — Representatives from most of the 61 chapters of the American Society of Tool Engineers, including five Canadian chapters, met at the Claypool Hotel here on October 10, 11 and 12 to discuss means for improving tools and methods used in the manufacture of war goods. The society now has almost 15,000 members, most of whom are engaged in war production activities. Officers include: president, Ray H. Morris, vice-president of Hardinge Brothers; first vice-president, Douglas D. Burnside, superintendent of Quick Meal Stove Co.; second vice-president, C. V. Briner, manager, Pipe Machinery Co.'s small tool and gage division; secretary, Earl V. Johnson, carbide tool engineer for Firth-Sterling Steel Co.; treasurer, Floyd W. Eaton, personnel manager for Crawford Door Co.; executive secretary, Adrian L. Potter. At an executive meeting, the board of directors agreed to hold the society's twelfth semi-annual meeting at Syracuse, N. Y., a year from now.

Five Technical Sessions

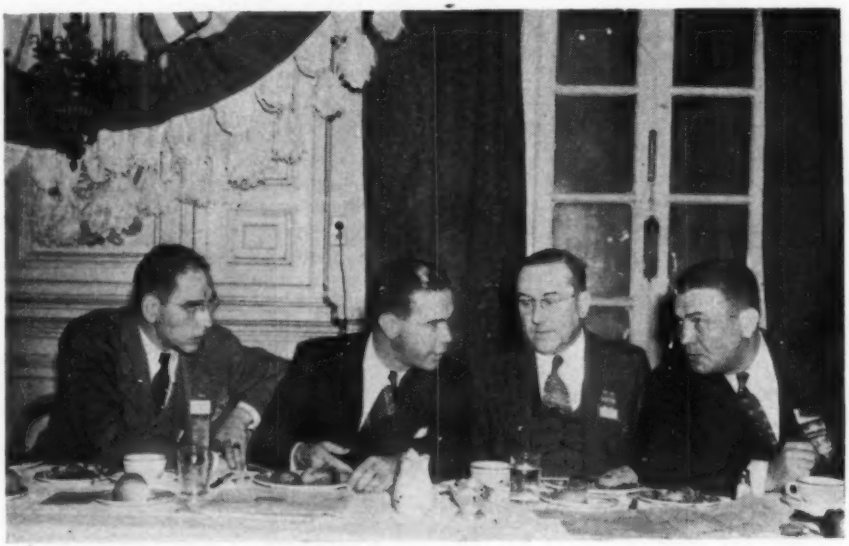
Five technical sessions were included in the program of this year's meeting. These included discussions of new heat-treating techniques, materials handling and plant layout problems, the design and production of aircraft as well as heavy-duty gears, the manufacture of machine parts from metal powders, the use of pneumatic, hydraulic and air-hydraulic devices for machine tool control and fixture operation, design and production features of the Allison engine, and the manufacture of Allison aircraft engine gears.

In discussing sub-zero refrigeration for austenitic decomposition of high-alloyed steels, G. B. Berlien, chief metallurgist, Lindberg Steel Treating Co., reported considerable improvement in cutting tool life when either tungsten or molybdenum high-speeds steel tools are cooled gradually, but continuously, from hardening temperature to below minus 110 F. before reheating for tempering. He said that best results cannot be obtained if the tools are allowed to remain at room temperature for even a few minutes before applying the sub-zero treatment, or if they are tempered before using this treatment.

The contribution of induction heating to the war effort was discussed by Dr. H. B. Osborn, Jr., of the Ohio Crankshaft Co. Robert L. Fitzsimmons of the E. C. Atkins Co. was chairman of the session on heat-treating techniques. Materials handling and plant layout problems were discussed by A. E. Rylander, Midland Steel Products Co.; R. W. Mallick, Westinghouse Electric & Manufacturing Co.; Ezra W. Clark, Clark Equipment Co.; and W. V. Casgrain and L. J. Bishop of Mechanical Handling Systems, Inc.

Gear Design Problems

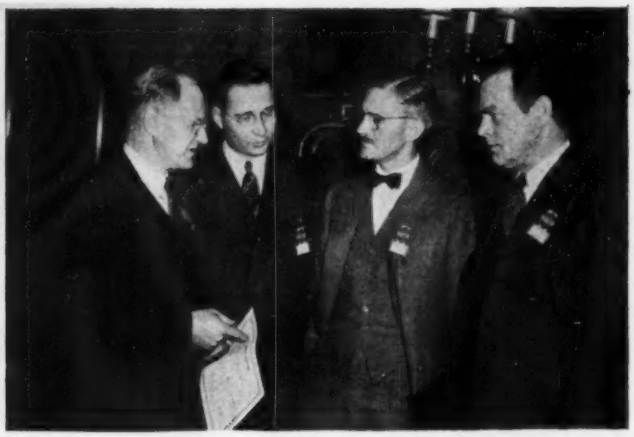
John L. Buehler of the Indiana Gear Works, Charles G. Pfeffer of Wright Aeronautical Corp., and W. P. Schmitter of the Falk Corp., discussed gear design and production problems, while Andrew J. Langhammer, president, Amplex Division, Chrysler Corp., told the delegates about the possibilities of using metal powders for the manufacture of machine parts. The application of pneumatic and hydraulic cylinders, control valves and other devices for operating and controlling machines, jigs, fixtures and other tools was discussed by L. R. Twyman of Vickers, Inc., and John C. Cotner and O. Wendell Macy of Logansport Machine, Inc. At the Allison Engine session, Dimitrius Gerdan, engine development engineer of the Allison Division of General Motors Corp., talked about the design and production features of the Allison engine, and Walter Folger and Richard S. Kegg discussed surface finishing and



Postwar problems were discussed at the semi-annual dinner by Douglas D. Burnside, first vice-president, A. S. T. E.; Scott Fletcher, director of field development, Committee for Economic Development; James R. Weaver, Westinghouse Electric & Manufacturing, who acted as toastmaster; and Ray H. Morris, president of A. S. T. E.

C. V. Briner, second vice-president of A. S. T. E., and Floyd W. Eaton, treasurer of the society, took part in most of the discussion

G. B. Berlien, Lindberg Steel Treating Co., Robert L. Fitzsimmons, E. C. Atkins & Co., and Dr. H. B. Osborn, Jr., The Ohio Crankshaft Co., described new heat-treating techniques, and their place in the war effort



Materials handling and plant layout problems were discussed by A. E. Rylander, Midland Steel Products Co., R. W. Mallick, Westinghouse, and W. V. Casgrain and L. J. Bishop of Mechanical Handling Systems, Inc.

gear manufacturing problems.

In his message to the members, Mr. Ray H. Morris, President, said, "The Tool Engineers' contribution to the War Effort's success is not complete. Heretofore-unheard-of volume production has made certain manufacturing economies obvious . . . startling innovations have been injected into production processes. But much remains to be done."

"High Goals for Post-War Business" was the subject of a talk by C. Scott Fletcher, director of field development of the Committee of Economic Development, at the banquet held during the convention. He was introduced by James R. Weaver, past president of A.S.T.E. and manager of the Louisville Ordnance Division of Westinghouse Electric & Manufacturing Co., who acted as toastmaster.

Scrap Drive Instituted to Meet Threatened Shortage

WASHINGTON — A "Victory Scrap Bank" campaign is being started by War Production Board. It is to be a national "all out" campaign for iron and steel scrap, with the heavier grades primarily desired, but all types acceptable.

Plants are being asked to re-survey for dormant scrap—dies, machinery, equipment, tools, molds, jigs, fixtures —and to move this material into scrap channels as promptly as possible. Says WPB: "If it hasn't been used for three months, and no use is apparent for the next three months, find a use for it or scrap it!"

Consuming steel mills and suppliers have on hand an inventory of about 7½ million tons, which will last only two months.

The drive will extend to November 15, with each community having its own scrap stock pile, or "Victory Scrap Bank."

Redistribution, Renegotiation and Priorities Discussed by A. M. T. D. A.

MONTEBELLO, QUEBEC—Both war and postwar problems affecting the sale of machine tools were discussed at the nineteenth annual meeting of the American Machine Tool Distributors' Association on Oct. 14-15. The redistribution and salvage of machine tools, the Washington situation (especially renegotiation), salesmen's compensation and the refusal of priorities by local WPB offices were among the subjects discussed. The Canadian Machine Tool Dealers' Association, headed by its president, C. S. Bradeen, was host to the members of the convention from the United States.

Disposal Policy Outlined

The general policy developed by the Ordnance Department of the U. S. Army for the disposal of surplus machine tools from war plants was outlined by Brigadier-General H. F. Safford, chief of the production service branch of the Industrial Division, Office of Chief of Ordnance, Washington. He pointed out that Ordnance Department is responsible for some 126,000 machine tools valued at $408,000,000. In getting back into active service those machines no longer needed for the tasks for which they originally were acquired, the Ordnance Department wishes to follow an orderly procedure and wants the advice and assistance of machine tool distributors.

Tools Sold For Use Only

Surplus machine tools controlled by the Ordnance Department will be sold

President

ALBERT M. STEDFAST,
Stedfast & Roulston, Inc.

1st Vice President

A. B. EINIG,
Motch & Merryweather Co.

Retiring President

DAN HARRINGTON
Harrington-Wilson-Brown Co.

Electronic Fatigue Tester—An engineering assistant in General Electric's general engineering laboratory places a metal sample for a "fatigue" test. Energized by especially powerful electronic equipment, this machine vibrates the sample from 30 to 20,000 cycles per second

only for immediate use and not for speculative purposes, said Colonel Haviland Wright, chief of the redistribution and salvage section of the production service branch of the Industrial Division. The prices asked for such machines, ranging from a minimum of 80 percent of the OPA ceiling to a maximum of 100 percent, are high enough to encourage purchase for pressing current needs.

Explains Tool Lists

Monthly lists of serviceable available machine tools are published by Ordnance. The prime objective in connection with machine tools is to keep production going full tilt and to see that any new production programs necessitated by battle experience are tooled up speedily, remarked Colonel Wright. Wherever possible, available machines are transferred from jobs already completed to ones where they can be used at once. Machine tools owned by the Defense Plant Corp. cannot be sold by DPC without the approval of the branch of the service involved.

A. G. Bryant, president Machinery & Engineering Co. and chairman of the association's government relations committee, expressed hope that the renegotiation law will be modified. He said that from now on renegotiation proceedings relating to distributors would be handled for all government agencies through the Navy Department. Some 9000 renegotiation cases, including verbal agreements, are expected to be settled by the end of 1943. Mr. Bryant's address, which touched on many topics relating to machine tool policies at Washington, touched off a prolonged discussion of renegotiation by the members present.

Mr. Bradeen read a letter from Thomas Arnold, machine tool controller for the Dominion of Canada, who was unable to be present, setting forth the thought that greater emphasis be put by distributors on the engineering rather than merely on the sales services rendered. If they should do that, they will establish their businesses on the soundest possible basis. Mr. Arnold suggested that patterns for the disposal of surplus machine tools in the United States may be set in Canada by actions already initiated.

Sales Discussed

A lengthy report on split commission sales was made by A. B. Einig as chairman of the Arbitration committee of the association. Conditions of sale were discussed item by item as presented by E. P. Essley, chairman of the committee on that subject.

N. P. Lloyd, president of Lloyd Machine Tools, Inc., made an address entitled "Aftermath" in which he outlined a plan for handling to the best advantage the machine tool situation after the war. His plan is not being made public at this time.

In a surprise ceremony General Safford, on behalf of Major-General Levin H. Campbell, Jr., Chief of Ordnance of the Army, presented to Mr. Lloyd a certificate signed by General Campbell citing him for meritorious service to the Ordnance Department in behalf of the war effort. The association itself later adopted a resolution commending Mr. Lloyd for his organization and direction of the machine tools panels which have aided the Ordnance Department in connection with its war production program.

Members Honored

The convention likewise adopted a resolution of thanks to Mr. Bryant for his able and intelligent leadership in handling the Washington affairs of the association. Another resolution cited the work done for the War Production Board by the following members of the association: E. B. Andrews, F. A. Brechter, Mr. Bryant, J. W. Chalmers, George O. Desautels, Mr. Einig, Arthur L. Free, Omar Hunt, R. M. Husband, Charles E. Moore, Charles A. Odegaard, J. Roy Porter, George F. Preston, E. F. Sands, E. J. Seifreat, A. M. Stedfast and E. E. Wagner.

Elect Officers

Albert M. Stedfast, Stedfast & Roulston, Inc., Boston, was elected president of the association for the next year. A. B. Einig, Motch & Merryweather Machinery Co., Cleveland, was named first vice-president; George Habicht, Jr., Marshall & Huschart Machinery Co., Chicago, second vice-vice-president; and C. C. Brogan, W. E. Shipley Machinery Co., Philadelphia, secretary-treasurer. New members of the executive committee are E. C. Elstad, Seifreat-Elstad Machinery Co., Dayton and Cincinnati, Ohio; Robert S. Page, Henry Walke Co., Norfolk, Va.; and O. W. Johaning, Colcord-Wright Machinery & Supply Co., St. Louis.

Dan Harrington, president of Harrington-Wilson-Brown Co. and president of the association, presided at all the sessions.

A Million Checks a Day

WASHINGTON—The U. S. government will soon be paying out an average of a million checks a day, or well over 300,000,000 a year, according to W. A. Julian, Treasurer of the United States. The huge total of the checks making the Treasury the "greatest disbursing enterprise in history" is largely accounted for by war expenditures and payments to families of men in the armed services. Mr. Julian said that much progress had been made in assuring prompt payment of obligations at a steadily reduced cost per check.

Inside Detroit

Big 1944 truck program may run into axle and transmission trouble. Seven tank types to be made. Industry tells Washington productive capacity is more than adequate. Replacement of Hudson in Center line management poses problems

BY SILER FREEMAN

Aircraft First, Trucks Next Next to the aircraft program, the truck program looms as the most important production goal for 1944. Not only the military but the civilian truck program will be launched soon, signs here indicate.

The most important, as far as the machine tool industry is concerned, involves the heavy duty military vehicles, ranging from the five to 15-tonners. They are now being designed and definite steps are being taken to get them into quick production.

How much of a machine tool building job it will turn out to be is not yet known. Unless the machinery can be drawn off from other fields, it will mean plenty of orders for the trade. The only source for the tools is the tank plants, which may by 1944 be able to give both machinery and facilities to the heavy duty truck program.

Right now most of the builders are pessimistic on the prospects. They wail that the program is beyond their capacities and that the whole thing resolves itself into a matter of axles and transmissions.

Cooperation May Solve Problem Despite this pessimism, there may be a solution in the form of the Standard Steel Springs Co. It will be remembered that it was Standard Steel Springs which stepped into the breech and broke the bottle neck on armor plate for tanks. It may do the same for the heavy duty trucks.

Standard Steel Springs organized other spring companies into a cooperative unit that turned out all the armor plating needed to put the tank program over. Now that the tank orders have levelled off, the companies find themselves with a great deal of forging capacity which is lying idle.

So in cooperation with Timken Axle, it has turned to the heavy trucks to keep their plants going and at the same time give a lift to truck builders. A swarm of production engineers have descended on Detroit and have set up offices in the Book Tower. Draftsmen are busy at drawing boards and things are shaping up for an early start.

Standard Steel Springs and its affiliated companies will probably get the job of turning out sufficient axles for the heavy duty trucks, while Timken may take on the transmissions, both bottlenecks. If they make the same success that they did in armor plating, the military can consider their goals achieved.

Divided Among Truck Companies It is understood that the "Big Three", General Motors, Chrysler and Ford will take on 30,000 each. The balance, amounting to about 150,000 will be distributed among International, Mack, White and smaller producers.

Superimposed on the military truck program will be the civilian truck program. Chrysler alone expects to build 25 percent more trucks in 1944 than it will in 1943 and this figure may be upped again before the year closes.

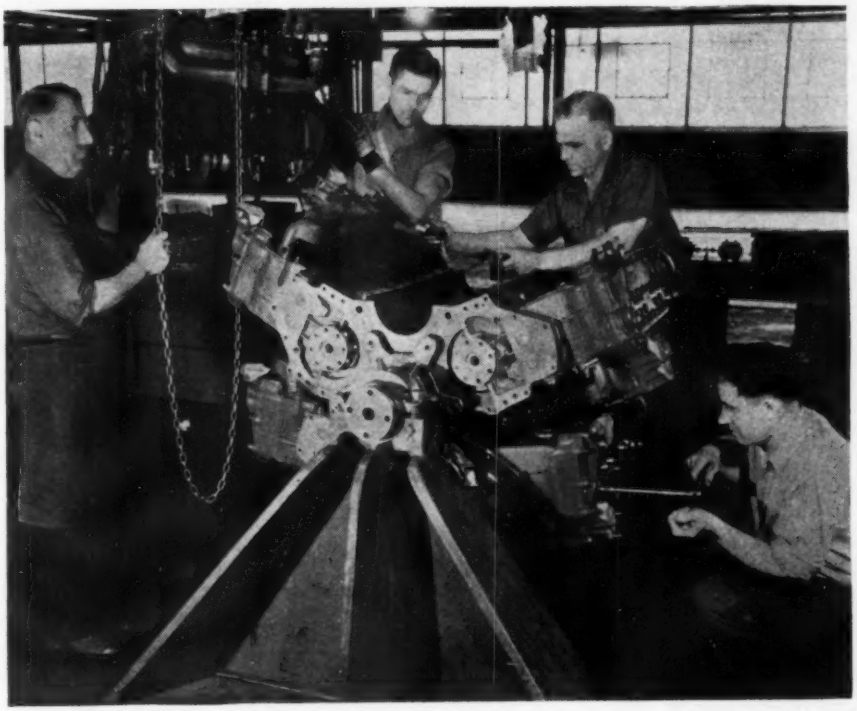
Contrary to all beliefs, the tank program will not be as sharply curtailed as was expected. The great difficulty with the present program, to the builders, is the variety which they are expected to make.

Greater Variety Of Tanks Instead of building one medium tank, the builders expect to be making about seven. The variety of guns will be much greater, and engines will vary greatly.

While the increase in volume has been levelled off, there will be more medium tanks built in 1944 than were produced in 1943. The capacity which has been built up since 1940 will not all be used but the output will be more than a mere trickle.

Trying to Lay Bugaboo "Paper shortages" of labor are costing Detroit millions of dollars in war contracts and may cost more. Idle men and machinery may result from fears of imminent manpower lack in this area and both business and industry are moving to recheck figures to convince Washington that Detroit can meet present contracts and take on some additional ones.

Fears are now expressed that existing contracts may be moved out of Detroit. While this possibility is remote, the speed with which the Navy Department unseated the Hudson Motor Company from management of the



Five on a Shaft—An engine formed by grouping five six-cylinders-in-line Chrysler auto engines around a central crankshaft, has been used in all "General Sherman" medium tanks made by that company. Above, four of them are in place and the fifth will fit into the groove at the top of fixture

Pin Checker—To insure high accuracy in manufacture of marine propulsion gears, General Electric measures both helixes by the pin check. The gear is rotated slowly and the operator inserts a hardened pin between adjacent teeth, which bears on the lever of the inspection instrument and gives a reading of how far it dropped between teeth. Distance between teeth must not vary more than 0.3 mil

Center Line Naval Arsenal is a warning that the services will not hesitate to jerk a contract from a firm which is threatened with any bottleneck.

Need Still More Women The U.S. Employment Service has estimated that Detroit plants will need 82,000 additional workers to keep up schedules by the end of the year. The only source remaining which has not been exhausted is the women. Figures since the first of the year show that more men have left factories than have been hired and only greater hiring of women has kept production from slumping.

Would Drive For Realism A drive to arouse community recognition of the danger to the "Arsenal of Democracy" has been proposed by industrialists and has been placed before the War Manpower Commission officials here. It is proposed to solve the "paper shortages" in the same manner as the materials shortages were solved, by close rechecking of figures and balancing of work against manpower, "realistic" scheduling of the labor needs for the next six months.

The community drive also will take in child care, housing and transportation as well as means of combating absenteeism and the labor turnover. Pressure will be exerted on more women to enter the field, whether it is in necessary civilian work or in plants. The acute situation in the civilian services, which affects the war effort, makes this part of the drive almost as important as getting workers in the plants.

Study Detroit Contracts Even now the new Production Urgency Committee, set up by the War Production Board, is studying the contracts here. New contracts, which would require additional manpower, have already been shunted away from Detroit. The production group may recommend that those already here be trimmed down to fit into the labor supply unless the drive succeeds, and fast.

One big drawback to the success of the drive seems to be the attitude of labor. It was not invited to sit in with business and industry in planning the community drive and so is lukewarm to it. The campaign was started when the United Auto Workers leaders were still in Buffalo and the first comment from labor leaders was extremely uncomplimentary.

Hudson Ousting Poses Problems The ousting of Hudson from the Center Line Naval Arsenal to be replaced by Westinghouse still remains a puzzler. The change will formally take place on October 28, but already former Hudson executives, shifted to the arsenal when Hudson took it over in October 1941, have started to resign. Several have already lined up jobs in outside plants and many more are expected to get out before the Westinghouse personnel arrives on the scene.

The arsenal changeover is being watched carefully. The transfer of the $60,000,000 layout with its 15 buildings has posed serious problems, the solution of which may prove difficult. For instance, Hudson sent some of its best engineers and production men to Center Line. Never having had a heavy supply of top executive material, the company may now need them to handle the enlarged aircraft program which Hudson has taken on.

What Westinghouse is planning has not yet been disclosed. It may put in an entire supervisory staff to run the arsenal or it may want to depend on some of the staff now in the arsenal. Question: Who will have the picking and choosing and on what basis can Washington retain the executives?

Labor Status Is Worrisome Another poser is the matter of union contract and seniority. The contract between Hudson and the UAW runs out in November. It will have to be renegotiated between the new operating managers and the union. But seniority is another matter. If the workers stay in the arsenal, who will guarantee their seniority rights? Surely not Hudson, for they will not be working for Hudson any longer.

Talk of Surplus Sales Bureau The hue and cry over the sale of the Army Air Force tools for a fraction of their costs seems to have died down. There is talk of setting up a bureau to handle such matters in the future but nothing definite has been done.

But more evidence of non-cooperation between the services are seen in reports of idle machinery standing about with no attempt to shift them to some other branch to be put into use. A high official stated privately recently that there were millions of dollars in machinery which has never been used, standing in plants which had contracts canceled before the machine tools could be put to use.

Red Tape Hinders Tools Transfer Some of these tools are owned by ordnance. Others are Air Force machinery. But no attempt is made to list them and exchange them. Because of the increased volume of aircraft work, attempts were made to get idle tools owned by ordnance into this field. But red tape discouraged those who were trying to get them. So they stand idle and gather dust.

Some of the same red tape is the basic cause of the sale of the tools which caused such a furore. Reforms are talked of but nothing is done, all of which speeds no sales.

Copper to Aluminum

NEW YORK—Anaconda Copper Mining Co. will design, construct and operate an extrusion plant at Columbus, Neb., for the manufacture of aluminum and magnesium parts for military aircraft, at the request of the War Production Board, the company has announced. To be operated by Anaconda Alloys Corp., a subsidiary, the plant will occupy 650,000 sq. ft. of productive space under one roof and will contain high pressure extrusion presses for production of shapes, rods, bars and tubes of aluminum and magnesium alloys for aircraft frames and engines.

Wartime Washington

Law to aid contract cancellation settlements holds spotlight. WPB liquidating billion in used equipment, but domestic sales prospects poor; foreign sales likely. Steel easing. Tool industry looks to 1944 volume of 1/3 billion. Pool orders are low

Hope for Speedy Settlement

With contract cancellation steadily increasing, industry's attention is concentrated on the Murray Bill, which offers the only answer to standardization of cancellation procedure by all Federal agencies. War contractors, smarting under financial set-backs imposed by "renegotiation," are not able to withstand long drawn out settlements of cancelled contracts. Although V-loans are now proving helpful in some cases, legislation is needed to: (1) Get some financial settlement to contractors as soon as possible; (2) Permit liquidation of material in process involved in cancelled contracts; and (3) Set a final equitable formula for settlement of contract claims.

Little Equipment Available Soon

Federal liquidation of $1,000,000,000 in used equipment owned by various government agencies has brought varied reactions from industry observers. Some sources believe that the bulk of this material should be scrapped to prevent severe dislocation of the machine tool and other industries. Others believe that this would be too wasteful so long as these items are of use to industry, especially since it is unlikely the public and Congress would tolerate large scale scrapping of millions of dollars worth of government-owned equipment. As it is, informed opinion leans to the belief that little of this equipment can be liquidated right now, although civilian type industries might come into the market for it early next year, and later on large shipments might be made abroad to help industralize China, India, Mexico, and reconstruct bombed areas in Europe. Latin-America is held as a doubtful market, since past sales of such equipment have not proven satisfactory, partly due to repair parts problems and some sales of below-standard items.

Carbon Steel Picture Easier

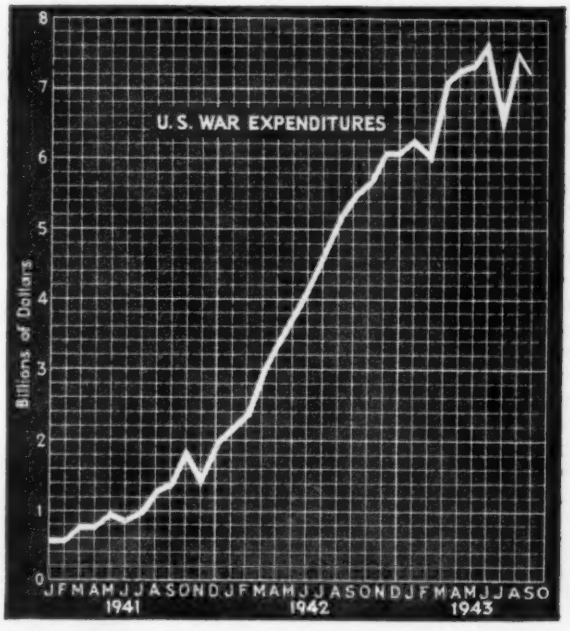
For the first quarter of 1944, carbon steel requirements as submitted are about 10 percent above expected supply. But after "screening" to remove inflated requests, supply is expected roughly to balance requirements. Moreover, if cancellation of orders and returns of allotments continue, it is possible that first quarter 1944 carbon steel situation may be much easier than many people believe. Cancellations have already cut mill backlogs of unfilled orders so that the industry is in better position to deliver against current CMP melt schedules. But hope for important amounts of steel for civilian requirements hings upon the flat-rolled situation, which is expected to continue serious through the first quarter of 1944. Meanwhile, pent-up demand for steel for the railroad, farm machinery, and construction equipment industries may have first call on any "excess" steel after all essential war needs have been met.

Conversion Will Lose Capacity

The machine tool industry now looks for a volume of some $325,000,000 worth of tool shipments in 1944, as against $1,321,000,000 in 1942, and estimates of $1,181,000,000 for 1943. Since the industry's monthly capacity is estimated at $100,000,000—$1,200,000,000 annually — after excluding shipment of non-industry sub-contractors of around $32,000,000, approximately two-thirds of its facilities will be available for outside work. However, capacity to handle annually $875,000,000 worth of additional machine tool orders in 1944 cannot be translated directly as equivalent capacity for other work, so that some productive ability will be lost in performing outside work. In any event, a good amount of work for the industry is reported to be available in spare parts for builders of construction machinery, trucks, and in turning out critical components, such as valves and blowers.

The industry has about cleaned up its pool orders, originally totaling $1,863,641,000, placed since February 1, 1941. With only $77,000,000 in pool orders left, the industry is seeking a substitute form of pool orders in the form of a DPC guarantee of the industry's entire backlog as protection against cancellations. In recent months, cancellations have played hob with production schedules, so that the industry has almost no idea of the number of forgings or amounts of steel to order now for use three to six months hence. A DPC guarantee would help to protect the industry against such hopeless disruption. Plan would permit completion of machines cancelled in process, and then their delivery to DPC account for preferential allocation against any new orders placed for such machines.

Manpower Climax— September war expenditures dropped to $7,212,000,000, or 4 percent below the August recovery point of $7,529,000,000. The $317,000,000 drop was more than would have been accounted for by the one-day-shorter month of September. The poor showing is attributed to particularly critical manpower shortages in September, while material shortages only eased late in the month



Decentralization Hinders Output

The practice of WPB regional offices in screening applications for new machine tools against available used equipment is

Automatic Studio—One of the most powerful—400,000 volt—X-ray installations in aviation industry is the largely automatic one at the plant of the American Propeller Corp., subsidiary of The Aviation Corp. After loading the blade-bearing cars, the operation goes ahead without human guidance until ejection from the "studio." Output is triple that of old methods

making it practically impossible for potential purchasers of new machines actually to buy any. As sound as this idea might be in theory, it has many shortcomings in practice. Dividing up the handling of applications among 13 regional offices has resulted in 13 different interpretations of the actual need for new machine tools, so that some manufacturers have been forced to buy unsatisfactory used equipment to do work which should be performed on new and highly accurate units.

Plants Report Better or Equal Output from Women Workers

NEW YORK — Women workers in plants studied by The National Industrial Conference Board, in the course of an inquiry just completed, are proving to be as good or better producers than the men in most cases.

Of 146 plants reporting to the Board, some 87, or nearly 60 percent, stated without qualification that the production record of their women employees was as good or better than those of men engaged on the same or similar work. Twenty-three reported women's production as varying from below, to above that of men. Four manufacturers of machines and tools or metal products asserted flatly that women are better producers.

In 36 plants, approximately one-fourth of the number reporting, women on men's jobs are producing less than men. In some instances executives explained that this is probably due to newness at the job, but that their output is expected to equal men's after they have learned.

Many executives explained that women's production records depend on the type of work. "Where mechanical skill is needed," an executive of an electrical products company remarked, "women's production is comparable to that of men. Where technical skill also is required, they aren't equal.

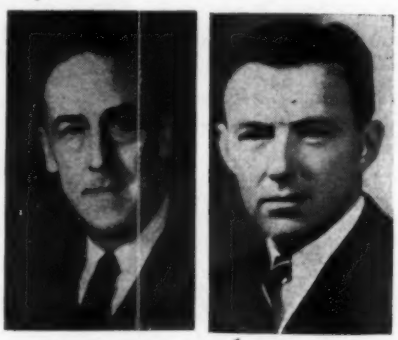
Better Working Conditions Will Raise Output: Perkins

WASHINGTON — Current difficulties in meeting war production schedules, blamed chiefly on manpower shortages, can be corrected in part by better physical working conditions, Secretary of Labor Frances Perkins reported today on the basis of a survey developed by the U. S. Department of Labor in consultation with the War and Navy Departments, the Maritime Commission, and the War Production

"When conditions leading to injury, illness, excessive fatigue, and undernourishment are neglected, the plant morale is lowered and the results eventually show up in less output, increased absenteeism and turn-over," Miss Perkins said.

Advisory standards for plants are suggested in a pamphlet, "Wartime Working Conditions—Minimum standards for Maximum Production," and are intended to supplement existing requirements under state and federal laws. The pamphlet is available from Division of Labor Standards, U. S. Department of Labor.

Correction



H. J. French A. L. Boeghold

In the issue of October 14, the names of Messrs. French and Boeghold were transposed beneath their pictures.

Incentive Plans Foreseen For West Coast Shipyards

BOSTON—Incentive pay plans will be introduced in West Coast shipyards, purely according to a statement made by Joseph D. Keenan, vice chairman for labor production of the War Production Board, speaking before the convention of the American Federation of Labor. The convention had previously oposed use of incentive plans lest they merely be "speed up" schemes.

According to Mr. Keenan, who was formerly secretary of the Chicago Federation of Labor, the plan would establish joint machinery for the effective operation of yard and post-management committees all along the West Coast to achieve economies in the use of labor in each yard and to exchange every technique found successful in any yard in raising individual output.

Conscription of labor, he said, would slow industrial output if it were attempted before every other course, such as labor-management cooperation, is tried. Industrial conscription, he went on, would involve setting up a huge administrative machinery and "would take the zip out of a great majority of American workers who at present are winning the battle of production."

He referred to the British national service legislation as being operated by the Ministry of Labor through skilled local officers where labor and management collaboration "is a time-tested reality." Even so, he added, conscription has not eliminated absenteeism or strikes in Britain.

SHIP DISPOSAL CONSIDERED

WASHINGTON—By the end of 1944, the United States will have built 50,000,000 deadweight tons of merchant ships, and "at the end of the war, will have an active merchant fleet of from 15,000,000 to 20,000,000 deadweight tons of fast ships," says Rear Admiral Emory S. Land, chairman of the Maritime Commission.

He suggests that the surplus of Liberty ships and slower models be disposed of by giving them away, chartering, selling or scrapping them, or by holding them in reserve.

Recently the War Shipping Administration announced a plan to scrap, for re-use of valuable equipment and parts, severely enemy-damaged merchant vessels which were able to reach port, but whose condition made rebuilding impracticable in highly congested yards. The procedure to be followed was worked out between the WSA, the War Production Board and the Metals Reserve Co.

Spotting The Air News

October plane output may top 8,000. Higher rate depends on manpower. Incentives may help. Plane program undergoing sweeping changes. Postwar market estimate at 5 percent of capacity. New electronic pilot helps bring damaged planes home

October production of aircraft probably will exceed 8000. The nine thousand mark will be reached "soon" in the opinion of responsible officials. Whether the 10,000 mark can be achieved by new year still is not certain. Manpower is still the chief hoodoo. In discussing it, WPB executives in charge consistently do not mention the Byrnes west coast manpower directive, which set up an elaborate system of committees and strengthened the hand of the Manpower Commission in aircraft. Instead, they talk about increasing the efficiency of workers in place and about curtailing turnover.

One aircraft agency chief named five major problems standing in the way of the desired increases in output: (1) that of getting more workers into the regions where they are wanted; (2) increasing worker efficiency by means of more efficient management; (3) curtailing the rate of worker turnover (which is now about 7 or 8 percent per month and should be cut down to 2 or 3 percent) so that less time invested in training will be lost; (4) creating community interest in workers' problems; (5) keeping up morale in general, with particular emphasis on suppressing "peace jitters."

Some WPB officials seem determined that aircraft and other weapon producers shall adopt worker incentive plans, though there has been considerable resistance on the part of employers. One aircraft company got a 12 percent increase in output with a well-managed incentive program. One of the WPB chiefs said he expected a half dozen or more airplane producers would adopt some sort of incentive plan. He said that 300 war producers in the last 60 or 90 days have adopted various incentive plans with excellent results. It is believed that the 12 percent increase above referred to was achieved by Beech Aircraft, which has had its plan in effect for one year.

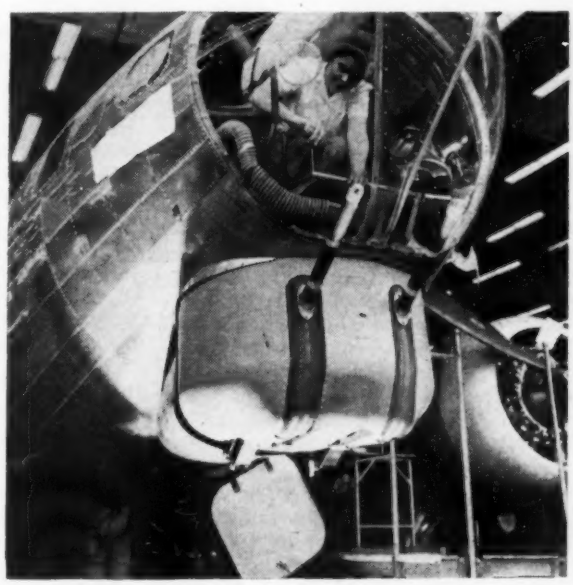
Charles Wilson is the chief proponent of incentive pay but he is having trouble getting it widely used, despite impressive case histories. Labor unions don't like it and it can't be installed in a plan without their approval. For one thing, they think that "incentive" is another name for piece work, which they have spent years getting rid of. For another thing, the unions want to end the war with an actual high-rate wage—something substantial to start cutting down from. And many managements are not crazy about the incentive principle: it sounds to them like another wage increase.

It can be said now that the stair-stepping schedules assigned to aircraft manufacturers are higher than expected output. The percentages of over-scheduling seem small but they are important, coming as they do so near the margin of possible and impossible. You get more airplanes by over-scheduling than you do by being purely realistic. It just happens to be the way Americans perform.

Sweeping changes are being ordered throughout the industry. Combat plane types that have become household words are being completely stopped, and other types that have proved more useful, or new types to meet the next step in strategy, are being put in their place. One of the major manufacturers has seen all of his designs marked for oblivion in the last few weeks, and he must change over to the production of other companies' designs. This sort of thing is not only a heartache but it is damaging in terms of postwar market. But there is no help for it. Incidentally, the postwar market for aircraft is rarely estimated at more than 10 percent of maximum war capacity, sometimes at less than one percent. Most recent estimate is about 5 percent.

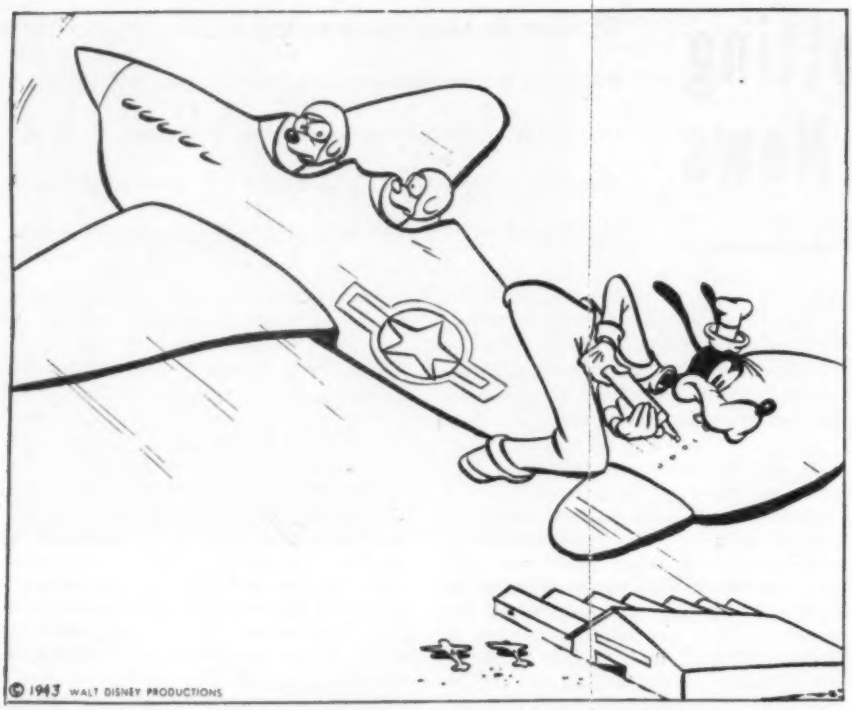
The Navy recently established an Aeronautics Section in its Industrial Incentive Division, which is headed by Rear Admiral Clark Woodward. The section is headed by Lt. M. R. Merryfield. The object is to stimulate worker interest, by reporting to plants the performance of their products in combat. Hundreds of parts are traced back to sub and sub-sub contractors. Returned heroes will talk to the workers. Equivalent of this organization in the Army is the Industrial Services Division headed by Col. Ralph F. Gow.

Minneapolis-Honeywell reveals that it has been producing an electronic pilot which has been in use by the Allied air forces since 1941. Alfred M. Wilson, vice-president in charge of the company's aeronautical division, explains that the sensitive instrument holds the plane steady — converts it to a steady firing platform, while the bombardier makes his run over the target, and it reduces the time required to make the run. Electronic pilot permits the plane to be flown from any one of several control stations in the plane. When mechanical controls and cables are shot away the plane can still be brought in.



Leading With the Chin—The new "chin turret" of the B-17G bomber rolling off of Vega assembly lines, answers the Nazi's favorite trick of frontal attack with two 50-cal. remote-controlled machine guns. More heavily armed than ever, the new B-17G retains all its old bomb carrying capabilities

For the third time the Navy has intervened in the management of



"Our Plant Has a Reputation for Speedy Production!" — The first copies of Walt Disney's "Mickey Mouse on the Home Front," a 4-color, 4-page cartoon magazine for war workers, has just reached the hands of thousands of men and women in plants of Glenn L. Martin, Ranger, Fairchild, Aeronca and Beach aircraft companies, Republic Aviation Corp., Raybestos Division and Wiremold Co. It's issued by Home Front Publishing Co., and inter-folded with house organs

Brewster Aeronautical Corporation. House Naval Affairs Committee is investigating charges that the company's production is very low. Brewster has been ordered to taper off on dive bombers for the British and for the Navy and concentrate on Navy's shipboard fighter "Corsair." Some Congressmen blame Navy itself, and labor and management of the company, all three for the existing conditions. The War Labor Board has warned the management that it is on probation for six months. Navy officials privately say they would pull out of Brewster entirely if they didn't need the planes so badly. Henry J. Kaiser, formerly chairman of the board under a new management installed at instigation of the Navy last spring, has been elected president, is giving the matter personal attention.

Army is still coy about mentioning the B-29, big relative of the Boeing B-17 bomber. But everybody knows about it, and some publications are no longer pretending it's a secret. Officially, only one statistic can be given about it: it's just about twice the size of the B-17, which weighs nearly 60,000 pounds. Unofficially, you can assume confidently that it has about double the range of the B-17 and more than double the fire power and bomb capacity. AMERICAN MACHINIST is informed by Boeing officials that production of the B-17 will continue at full capacity. The B-29 goes into new facilities and into some plants from which other types are being removed. Production has already started. This plane is wanted now for use against Germany and especially for the attack on Japan at longer range.

The Aircraft Scheduling Unit, at Dayton, Ohio, is improving its redistribution program to handle idle and excessive surplus steel, copper, aluminum and aircraft hardware, by including the listing of components in the redistributing reports, and by simplifying periodic reports. Also, the ASU has issued a catalog of brass mills and their products to assist aircraft manufacturers in placing their orders with the proper mills.

Please note: Future of cargo gliders has cooled off to approximately zero. . . . Perfection of helicopters will take longer than the public has been led to believe; engineers don't know how air behaves on a rotating wing; are not sure how to find out; can't yet figure stresses. . . . Wood in aircraft construction is on the way out; difficult maintenance is the reason. . . . Success of air cooled engines in tanks tempts engineers to try it in autos, a much easier problem.

Mid-1944 Earliest Hope for Resumed Civilian Production

WASHINGTON — Reports indicate that the Office of Civilian Requirements' earliest hopes for resumption of sizable production of civilian household items are for the second quarter of 1944, except for electric irons, production of which will shortly be permitted to the extent of two million by plants in easy labor areas. Major obstacle blocking large scale resumption of production of refrigerators, washing-machines, and vacuum cleaners, is the critical situation in flat-rolled steel products. Without sheet steel very few civilian items could be produced, and the sheet situation is not expected to ease before the second quarter of 1944.

Electric Motors a Factor

In considering the possibility of resumption of such production, War Production Board officials point out that electric motors are not likely to be available in adequate quantities for civilian items until the second quarter of 1944, if not the third quarter. In the meantime, the current critical labor situation in many areas, and the extent of concentration on war production by many large plants normally producing civilian type items, are factors which must be contended with in any attempt to convert production back to civilian goods. About 50 percent of total plant capacity of refrigerator manufacturers, for example, is engaged in turning out bomber parts, and so long as bombing-plane requirements call for such activity, little plant capacity will be available for anything else. The balance of these plants is occupied with turning out machine-gun parts, etc.

Wilson Has Civilian List

At present, a list of various civilian items on which the resumption of production is desirable and the amount of various materials required for such production is in the office of Charles E. Wilson, assistant to Donald Nelson, for study. It is reported that the list is not set up on a priority basis for each item, in view of the varying amounts and types of materials and production facilities involved. However, OCR's field surveys indicate that washing-machines and refrigerators are high on the list, with bicycles being toward the end of the less essential items for civilians.

Reports of prompt resumption of such production are discounted, because of the time required to reconvert such plants from war work to civilian goods production, estimated to range from 30 days to as long as 6 months. Moreover, many plants will have to begin the production of parts in the plants of their suppliers well before they can begin the final assembly and finishing work.

Washington Appointments

WPB, Miscellaneous:

Richard P. Brown, vice president of Minneapolis-Honeywell Regulator Co., deputy director, Third Region, Philadelphia. Advisory Committees—Coated Abrasive Industry, Franz T. Stone, presiding officer; Piston Ring Manufacturing Industry, Norman B. Johnson, presiding officer; Steel Controls Industry, W. A. Hauk, presiding officer.

Combined Production & Resources Board:

W. M. Black, executive director, succeeding Arthur B. Newhall.

NAMES in the NEWS

I. S. Babcock

Irving B. Babcock has been appointed a vice president of General Motors Corp. and general manager of the newly formed GMC Truck & Coach Div., Pontiac, Mich., which is taking over the business formerly conducted by the Yellow Truck & Coach Mfg. Co. Mr. Babcock joined the Yellow Cab Mfg. Co. in 1920 as comptroller, later advancing to treasurer. He moved to Pontiac in 1925 as vice president of Yellow Truck & Coach, becoming executive vice president in 1932 and president and general manager of the truck company in 1935.

James C. McKay, formerly vice-president of the McKay Co., Pittsburgh, Pa., producers of welding electrodes, chains, has been advanced to the position of president and treasurer of the organization.

Whitley B. Moore has been advanced to the position of director of sales for all divisions of Timken Roller Bearing Co., Canton, Ohio, including industrial, automotive, railroad, service sales, steel and tube, and rock bit. He joined Timken immediately after World War I, advancing to general manager of sales of the steel and tube division in 1940. Mr. Moore is succeeded in this latter position by C. H. McCollam who has been assistant general sales manager of the division since 1940.

Carl Luth, who has been serving as acting chief engineer at the Duquesne Wks., Carnegie-Illinois Steel Corp., Duquesne, Pa., has been made chief engineer at this U. S. Steel subsidiary.

Grant S. Diamond has been named president of Electro Refractories & Alloys Corp., Buffalo, N. Y., manufacturer of resinoid grinding wheels, crucibles, refractories and alloys. He has been executive vice president since 1941 Mr. Diamond joined the company in 1923 as assistant research chemist and became plant manager in 1929. Three years later he assumed the vice presidency. Carl F. Leitten has become vice president in charge of manufacturing. He became associated with Electro Refractories in 1926 as laboratory assistant and served as superintendent of the Refractories Div. from 1936 to 1942 when he was made superintendent in charge of production. In January of this year Mr. Leitten was named plant manager.

Electro Refractories Executives

G. S. Diamond

C. F. Leitten

Bernard L. Whelan has been appointed general manager of Sikorsky Aircraft Div. of United Aircraft Corp. Mr. Whelan has been connected with United Aircraft for 15 years, joining the corporation as a test pilot.

Courtlandt S. Gross, president of Vega Aircraft Corp., Burbank, Calif., has been named vice president and general manager of the parent company, Lockheed Aircraft Corp., Burbank. Harris McIntosh, formerly in charge of production control at Vega, has become special assistant to the president at Lockheed.

Carl G. Strandlund, who was formerly in charge of the Armor-Plate Div., Chicago Vitreous Enamel Product Co., Cicero, Ill., has been appointed vice president and general manager.

A. H. Philpot has been named assistant to the president, Warren Div., Copperweld Steel Co., Warren, Ohio. Mr. Philpot will continue to make his headquarters in Washington where he has been in charge of the company's Steel Div. office.

G. S. McKee

Grosvenor S. McKee has become vice president and works manager of Talon, Inc., slide fastener manufacturer, Meadville and Erie, Pa., plants. From 1938 to 1942 Mr. McKee was production manager in charge of these plants. Early in 1942 he resigned to become works manager of three plants of American Type Founders, Inc., Elizabeth, N. J., making munition products. He has been active in manufacturing work for the past 20 years.

W. E. Addicks has been appointed manager of the New York district office of Cutler-Hammer, Inc., electrical manufacturers of Milwaukee.

John Gordon Bell has become district sales manager of Follansbee Steel Corp. for the metropolitan New York and New England areas with headquarters in New York City.

Howard W. Bennett has been named manager of the Specialty Div. of General Electric Company's electronic department. Mr. Bennett joined the organization in 1930 as a radio field representative, becoming district radio sales manager with headquarters at Minneapolis in 1935, and then manager of the renewal tube sales section in 1939.

Gwilym A. Price has been named vice president of Westinghouse Electric & Mfg. Co., Pittsburgh. He was formerly president of the Peoples-Pittsburgh Trust Co. In his new position, Mr. Price's responsibilities include settlement of war contracts.

Owen L. Holland has been appointed district manager of the Welding Div. for the Chicago territory of Metal & Thermit Corp., producers of metals, alloys, welding electrodes. At one time he was general manager of the Koro Corp., electrode manufacturers, and later general sales manager of the Hollup Corp., welding electrode and accessories makers.

Raymond J. Griese has become works manager of Boye & Emmes Machine Tool Co. at Cincinnati, engine lathe makers, having been named to succeed George A. Mohr who died recently.

D. M. J. Tracey

Dorothy M. J. Tracey, vice president of Tomkins-Johnson Co., Jackson, Mich., makers of air and hydraulic cylinders, riveters, clinchers, die sinking milling cutters and air controls, has been appointed general manager. Mrs. Tracey has served for a number of years as purchasing agent prior to her advancement to vice president in 1939. She succeeds A. R. Johnson in that capacity, enabling him to devote more time to problems of manufacturing and sales.

A. J. Bradley has been appointed general sales manager of Prack Laboratories, Inc., makers of industrial skin protective creams.

John Splain has been appointed director of purchases for Hub Industries, Inc., Long Island City, N. Y., producers of hydraulic aircraft equipment. Mr. Splain was formerly New York commissioner of motor vehicles and actively associated with the automotive industry for 30 years.

BUSINESS ITEMS

Clearing Machine Corp., Chicago, manufacturer of hydraulic and mechanical presses, has opened sales and service offices in New York City and Cincinnati, headquarters in New York are at 30 Rockefeller Center, with J. R. Sheppard in charge. W. F. Dew is in charge of the Cincinnati office at 2107 Carew Tower.

Detroit Tap & Tool Co., Detroit, has established a factory branch office at 1506 Toledo Trust Bldg., Toledo. The company has expanded its lines to include the production of tapping machines, tap reconditioners and thread milling cutter checking equipment in addition to precision ground thread production tools and gages.

Baldwin Locomotive Wks., Philadelphia, has opened a district office at 10 High St., Boston, under the managership of Wilbur H. Whitty. Mr. Whitty will direct sales in the New England area for all divisions of the company including the Locomotive and Ordnance division, Baldwin-Southwark division, Cramp Brass & Iron Foundries division, Standard Steel Wks. division, Baldwin De La Vergne Sales Corp., and Pelton Water Wheel Co.

Colonial Broach Co., Detroit, has announced the opening of direct factory offices in South Bend, Ind. and Cincinnati, Ohio. The former office is located at 601 Tower Bldg., with T. S. Mellen in charge; while the Cincinnati office at 1409 Union Central Life Insurance Bldg. is headed by E. W. Brock.

North American Philips Co., Dobbs Ferry, N. Y., wire producer, will move its commercial and administrative departments late in November to the Pershing Square Bldg., New York City. The Industrial Electronics Equipment Div., which markets Norelco electronic products, will also move to that building.

John R. Cassell Co., New York City, dealer in drafting supplies and technical reproduction processes and materials, has established a new department known as the Industrial Photographic Materials Dept.

Advance Pressure Castings, Inc., has moved its executive offices to 894 Manhattan Ave., Brooklyn, N. Y.

E. Karelsen, Inc. has moved into larger quarters at 125 W. 45 St., New York City to meet the increasing demand for its line of diamond pointed and tungsten carbide tools.

Frederick Post Co. of Chicago has announced that the 20th Century Blue Print Co., 344 Bush St., San Francisco, has taken on the complete line of Post drafting materials and instruments.

OBITUARIES

Wm. R. Beatty

William R. Beatty, 66, founder and president of the board of Beatty Machine & Mfg. Co., Hammond, Ind., manufacturer of punching and shearing machinery and hydraulic equipment, passed away at his home. Mr. Beatty founded the company 26 years ago and was active in its management until shortly before his death. As a young man he worked with an iron and steel concern in Pittsburgh, and later as general superintendent of the New Castle Forge & Bolt Co., New Castle, Pa. At one time he was Chicago sales manager for Williams-White Co. of Moline, Ill., maker of presses, punches, shears, tube and pipe bending machinery. Mr. Beatty organized his own company in 1917 for the manufacture of heavy metal-working tools.

J. E. Brobst, general consultant of the industrial control engineering division of General Electric Co., Schenectady, N. Y., died in that city following a brief illness. Mr. Brobst had been associated with the company for 40 years and is credited with many important contributions to the development of industrial control equipment. He was made manager of the Bloomfield, N. J., plant in 1929, returning to Schenectady the next year to head the industrial control engineering department. He continued in that post until the first of this year, when he became general consultant to the department.

E. Gruenewald

Eugene Gruenewald, 64, president of Ross Gear & Tool Co., Lafayette, Ind., died suddenly while on vacation at Asheville, N. C. He had been associated with the organization for 21 years, starting as factory manager. Previously Mr. Gruenewald had been general manager of R & V Engineering Co., Moline, sleeve valve engine builder.

William Jack Totten, 82, retired United States Steel Corp. executive, passed away at his home in Evanston, Ill. after a short illness. Mr. Totten joined the Andrew Carnegie enterprises in Pittsburgh in 1880. He had been sales manager of the St. Louis office of U. S. Steel, then went to Chicago in a similar capacity, and was head of the St. Paul-Minneapolis division at the time of his retirement in 1931.

Harold G. Hobbs, metal process engineer, Quaker Chemical Products Corp., Conshohocken, Pa., died a short time ago. Mr. Hobbs joined the company in 1941, and at the time of his death was a district manager in the Cincinnati and surrounding area.

MEETINGS

National Aircraft Standards Committee. National meeting. Lexington Hotel, New York, N. Y. Nov. 8-12.

Society of the Plastics Industry. Fall meeting. Waldorf-Astoria Hotel, New York, N. Y. Nov. 8-9.

Shop Equipment News

Bliss 1100-Ton Hydraulic Forging Press Features Drum Type Control for Reciprocation and Inching

E. W. Bliss Co., 53 St. and Second Ave., Brooklyn 32, N. Y., has developed a 1100-ton self-contained hydraulic forging press equipped with a 35-ton ejector and sliding die table. The press is electrically controlled and interlocked so press, die-slide and ejectors operations can occur only when the various actions are in proper position.

Actuated by a 150 hp. pump unit, the press has a quick advance of 750 in. per min.; press speed of 37 in. per min., and return speed of 725 in. per min. However, equipment with faster speeds is available if required.

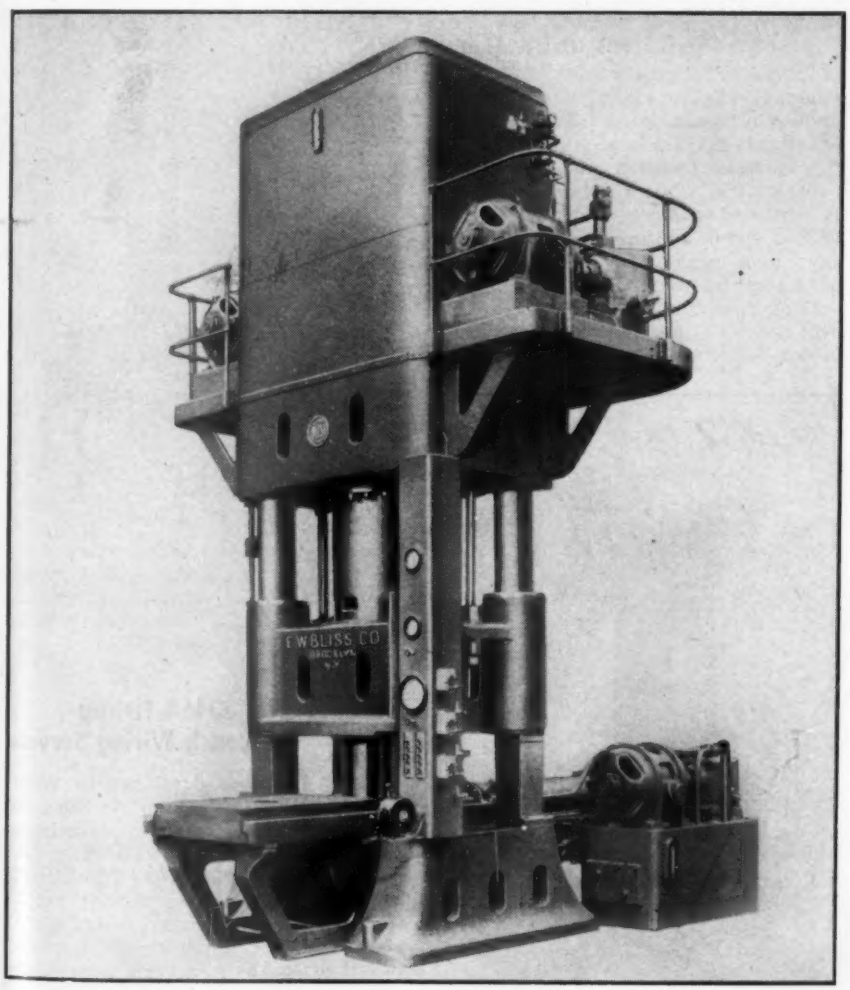
Four distinct operational controls are provided for the main slide: semi-automatic; fully-automatic; joggling control, and inching control.

Under semi-automatic control the press completes one press cycle and then stops. Under fully-automatic operation, the press slide operates continuously until a stop button is pushed.

A drum-type switch permits small reciprocations of the press in response to switch positions but still permits quick advance and quick return features. With inching control, minute distances of press aproach can be governed by pushbutton control. The press descends only as long as the down button is depressed and only at pressing speed. Opening is controlled the same way. Inching control has the same safeguards against overpressure and overtravel as the production control.

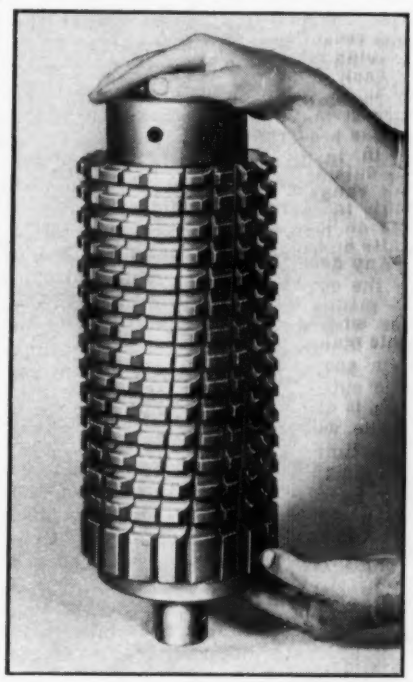
A feature of the joggling and inching controls is the ability to set the pressure switch for reversal and have this reversal function even though either the joggling lever or the inching button is held in the down pisition, the press reversing at the predetermined pressure. The universal control features of this press have been in use for more than two years on presses engaged in the manufacture of aluminum billets and aluminum drop forgings.

The die-slide is operated by a separate pump which also operates the ejector in the die-slide or interlock, the two not functioning at the same time.

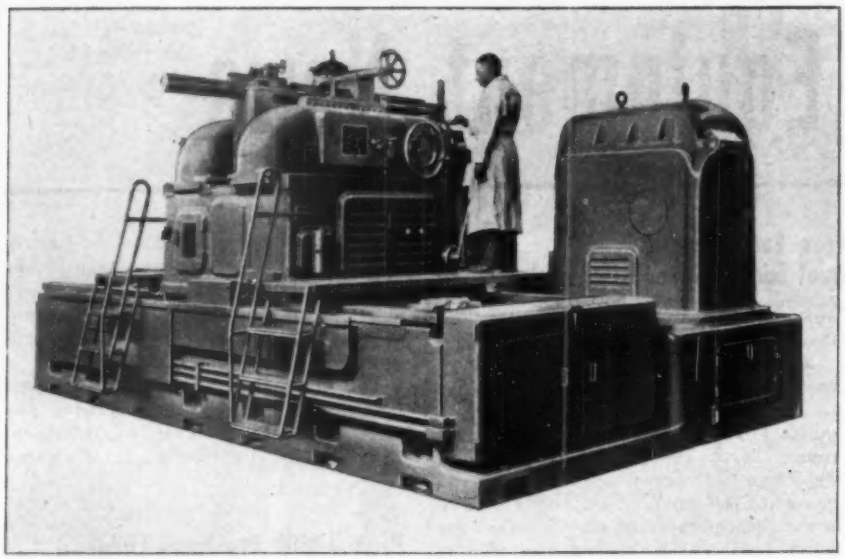


Plan-O-Mill Produces Large Multiple Thread Milling Cutter

Multiple thread milling cutter 12¾ in. long and 6½ in. in diameter is being produced by Plan-O-Mill Corp., 1501 East Eight Mile Road, Hazel Park, Mich. The cutter threads gun tubes, breech blocks, and other internal and external threaded parts up to 16 in. in diameter. It also provides the Higbee cut, by which the imperfect thread is removed coincidental with milling the head. In threading gun tubes, these cutters rough, semi-finish and finish the cuts.



Difficulty in producing this large aforging with the necessary uniform hardness has been overcome by segmenting the cutter. This is said to have the further advantage of providing a spiral gash cutting action for smoother milling and improved work finish with straight gash grinding.



National Broach & Machine Builds Gear Shaver For Gears Up to 97 in. in Outside Diameter

The recently completed Red Ring gear shaving machine made by the National Broach & Machine Co., 5600 St. Jean Ave., Detroit, Mich., is said to be the largest machine of its type ever built. It has a capacity for gears from 24 to 96 in. in pitch diameter and up to 97 in. outside diameter. Maximum shaving range from headstock spindle is 110½ in. The machine is designed for use on large steam turbine reduction units and large diesel timing gears.

Any desired setting within the range of the cutter head can be made easily by means of a vernier scale and sine bar with which the head is equipped. This makes it a simple matter to duplicate accurately any previous setting. The cutting tool, which is free to rotate, is driven by the work gear.

The work gear may be checked at any time without removing it from the machine. An integrally built checking head determines the size of the work gear, its linear pitch, wobble, eccentricity and pitch diameter. Alignment of the work gear can be checked from either side of the machine. It is mounted on journal bearings supported by adjustable pedestals.

A separate motor drive makes the headstock a selfcontained unit. It has special sleeve-type bearings and change gears to regulate the rotating speed of the work gear. The latter is driven through a flexible coupling.

Cutter and checking heads are mounted on a saddle, and this assembly is also selfcontained, with its own motor drive, pressure lubrication and controls which govern the length of stroke. Controls include a safety stop. The cutter head slide is reciprocated across the face of the work gear during the cutting cycle. Automatic feed and a preselector for varying the amount of feed are provided. Control of the cutting cycle can be either manual or automatic.

Three control stations are provided, one at the position indicated by the operator in the illustration, one on the opposite side of the machine and the third at the base of the work headstock. Two of these have master stop pushbuttons. A bank of lights tells the operator when the saddle is in feed and the direction of movement.

Standard Lathe Permits Two Operations at One Time

Standard Electrical Tool Co., 2488 River Road, Cincinnati, Ohio, is producing a speed lathe of double-end construction. The right hand end of the machine is fitted with a Sjogren collet chuck, while the left hand side is furnished with a 4 in. universal lathe chuck. This feature is provided to save floor space and to permit two operators to work at the same time.

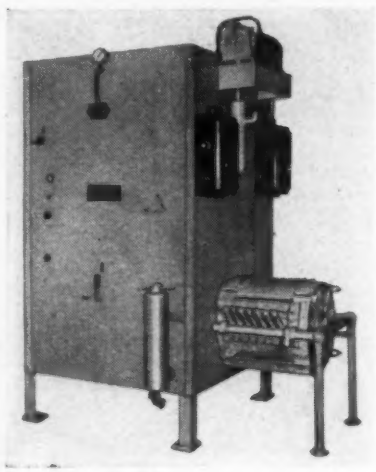
Each operator is independent of the other as a combination clutch and brake permits either side of the machine to be controlled independently. The lathe is equipped with a 1 hp. motor, which is individually controlled by toggle switch.

This speed lathe is available as a single-end machine in ½, 1 and 2 hp., with speeds from 50 to 3,450 r.p.m. A bench model with pedal control can also be supplied.

Hilco Airline Purifier For Many Industrial Oils

The Hilco Airline oil purifier has been developed by Hilliard Corp., 370 West Fourth St., Elmira, N. Y., for the purification of aircraft engine lubricating oil, but has wide application in purifying many industrial lubricating oils. The equipment is suited also for the purification of insulating oils such as used in transformers and circuit breakers. This Model A-50 unit has a capacity of 50 to 65 gal. per batch per hr. Other units are available in capacities of 75 to 130 gal. per batch per hr., as well as special purifiers of larger capacity.

The oil to be purified is drawn into the heater tank and mixed with Hilite, a grade of fuller's earth. This mixture is thoroughly agitated and heated to eliminate all traces of water, moisture and fuel dilution. The Hilite acts to absorb solids, such as carbon, tarry matter, abrasives and acids. After heating, the mixture is dropped into a

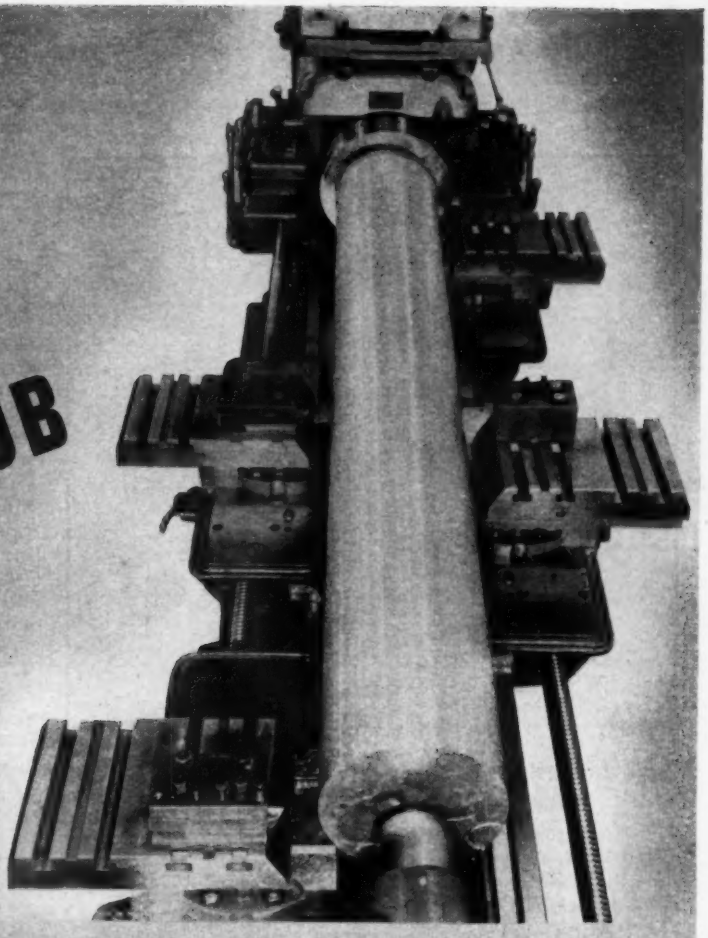


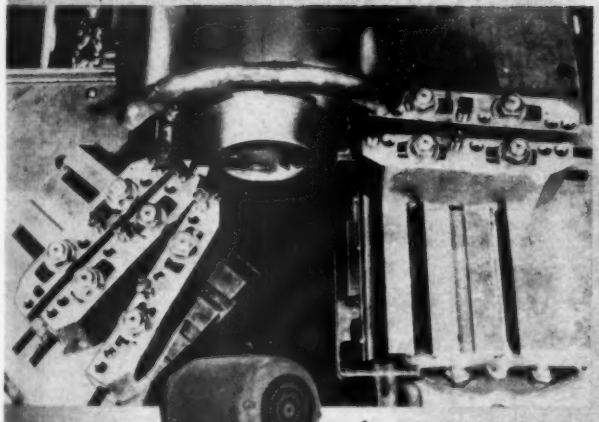
rundown tank, and then is forced by compressed air into a filter press where the solids are retained. The oil is passed through a secondary filter press for a final quench.

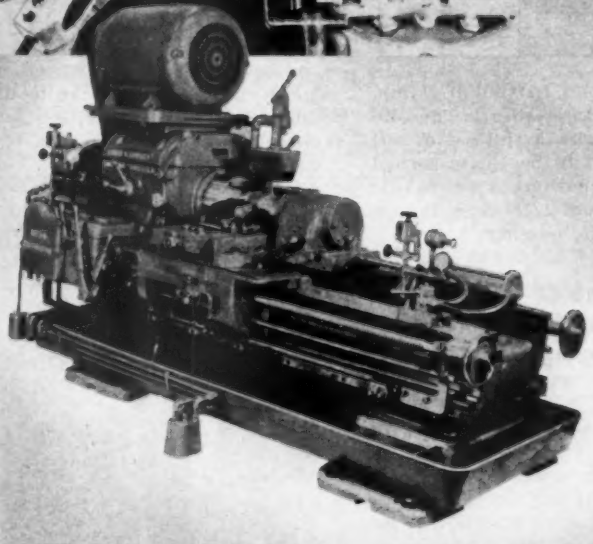
Wiremold No. 3046A Fitting For Bench Wiring Service

A fitting has been developed by Wiremold Co., Hartford, Conn., to take the 20 amp. twistlock type receptacle or any standard device when mounted with Wiremold No. 3000. This fitting has been designed to permit ample wiring space, and is used in industrial plants for bench wiring, dollies, and in other locations where heavy-duty receptacles are required.

THE LONG JOB AND THE SMALL JOB







THE No. 3A Duomatic Lathe brings time-saving application of multiple tools to a great variety of jobs. Write for Booklet No. 601-FL on this fully automatic lathe, efficient on long or short jobs—large or small lots.

Since March 6, 1942

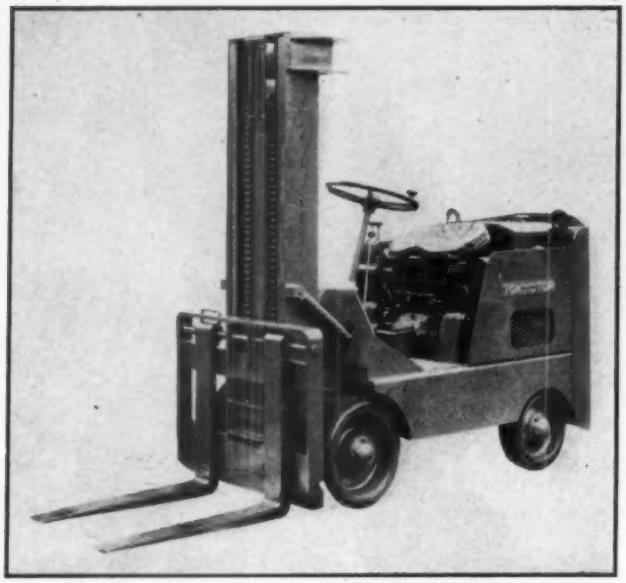
THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI, OHIO, U.S.A.

ENGINE TOOL ROOM AUTOMATIC OIL COUNTRY LATHES

Towmotor Fork Lift Truck Has Wide Range Capacity

A fork lift truck, designated as LT-50, has been brought out by Towmotor Corp., Cleveland 10, Ohio. The truck is available with either 104 or 144 in. lift for 5,000 lb. capacity, or for 4,000 lb. capacity with 144 in. lift.



This lift truck is designed for lifting, moving and stacking all types of materials.

Maximum travel speed of the truck is 8 miles per hr. Loaded lift speed is 40 ft. per min. The truck has a 50 in. wheelbase, outside turning radius of 92 in., and over-all width 42 in. It is 88 in. long without the forks. Standard fork equipment is 36 in. in length.

Center underclearance of 6 in. permit maximum maneuverability in close quarters and along narrow aisles.

Lowe Makes Inspectograph For Viewing Small Pieces

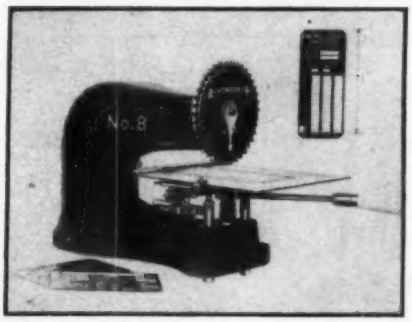
The No. 5 Inspectograph is being produced by S. Lowe & Sons Co., 30 Sanford St., Fairfield, Conn. This instrument is designed for inspecting work

up to 6 in. in size for minute scratches, small cracks, burrs, faulty threads and other defects not visible to the eye. The Inspectograph provides five-power magnification and utilizes shadowless fluorescent lighting.

Acromarker Nameplate Machine Stamps on Wood or Metal Parts

No. 8 Acromarker nameplate and parts stamping machine, made by Acromark Co., 9-13 Morrell St., Elizabeth, N. J., is suited for use on steel, brass, zinc, plastic, fiber and pressed wood plates and parts. The machine stamps the plates and parts in any position up to 9 in. from the top. It takes pieces up to 2½ in. thick and as large as 10x12 in.

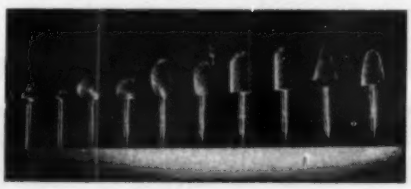
Automatic advance moves the part in a level plane to the left after each character has been stamped, evenly spacing each letter or figure. A screw operated by hand lever lifts the table



with the work, held by thumb clamp, against the marking dies. The die wheel, which carries a full set of letters and figures, can be easily turned to the desired character. Extra die heads ranging from 1/16 to ⅜ in. are available for interchanging.

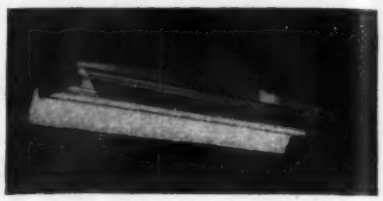
Ford Makes Carbide Cutters In a Variety of Shapes

A line of carbide rotary cutters in five different shapes and ten sizes has been brought out by M. A. Ford Manufacturing Co., 732 West First St., Davenport, Ia. The cylindrical, flat end face cutters, range in size from ¼ × ½ to ½ × 1 in. Cylindrical, radius end cutters are available in sizes ¼ × ½ to ⅝ × 1 in. Spherical cutters are available from ⅜ to 1 in., while elliptical shaped cutters are ½ × ⅞ and ⅝ × 1 in.



The tree shape, radius end cutter is furnished in ½ × 1 in. Conical shaped cutters are ⅝ × 1 in. Deburring tools with a 90 deg. included angle can be supplied in ¼ and ½ in. sizes.

Super-Illuminator Unit Has One-Piece Channel

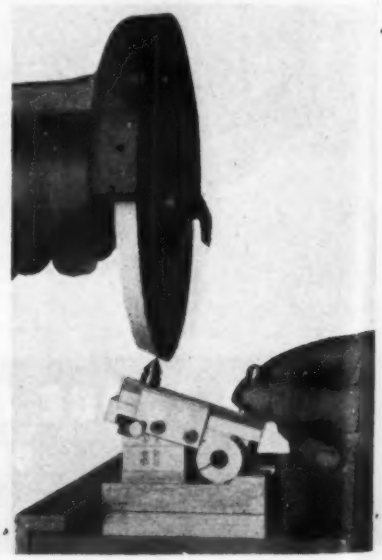


Edwin F. Guth Co., 2615 Washington Ave., St. Louis, Mo., is offering the Super-Illuminator fluorescent unit in sizes for two 40-, three 40-, and two 100-watt lamps. It is said that high strength is provided by the die-formed one-piece full channel.

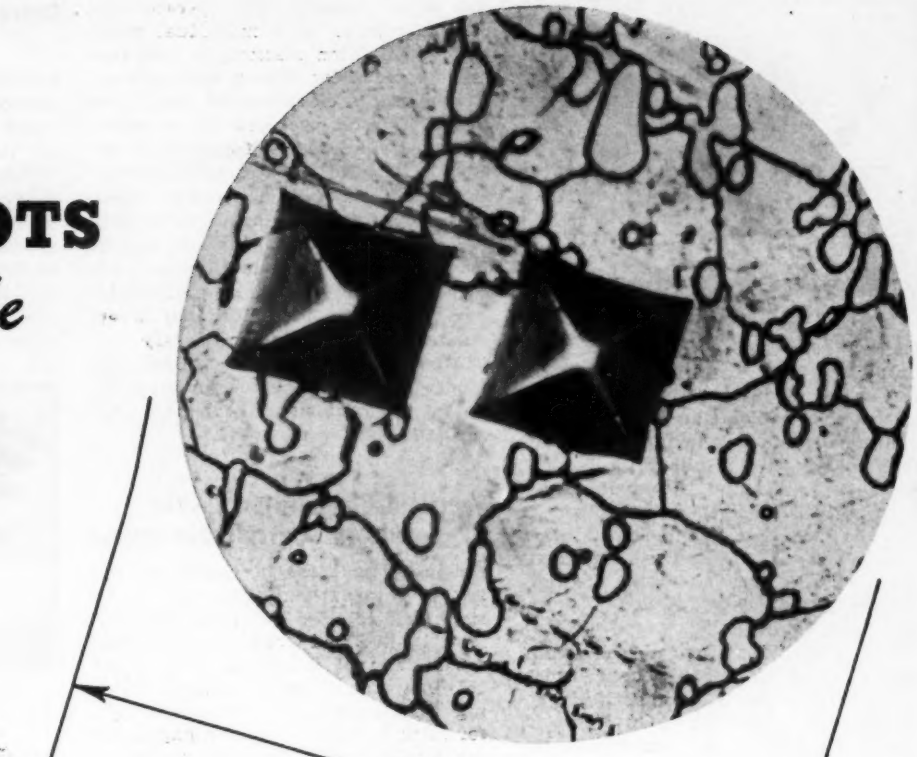
All wiring and auxiliaries are fully inclosed. Starter switches are accessible without removing lamps. Added lamp holder protection is provided in the bump-proof endplates. The reflector is formed of Masonite and finished in white synthetic enamel. Eggcrate louvres are available for lamp shielding if desired.

Florian Wheel Dresser For Angular Form Grinding

For dressing the wheels of surface grinders to required angles, Florian Manufacturing Co., Plantsville, Conn., is offering a sine angle wheel dresser. With the aid of standard gage blocks or adjustable parallels, wheels to any angle form 0 to 90 deg. can be dressed within ±10 sec. The setting is determined by the formula: sine × 2 in. +0.300 in. = angle.



MICRO DOTS
now tell the REAL STORY



.0025"

of Michigan Gear Cutting

TOOL STEEL

Checking the correctness of heat-treat of gear cutting tool steels by conventional methods alone has now been obsoleted by Michigan Tool Company. In the metallurgical laboratory at "Gear Production Headquarters" you will find such steels checked by new MICRO-hardness testers—under a 1000 power microscope.

This tester gives the individual hardness of every portion of the basic grain structure, where conventional methods can give only the average hardness of the grain particles covered. Ten of those dots, above, would not stretch across the diameter of the equivalent Rockwell "mark".

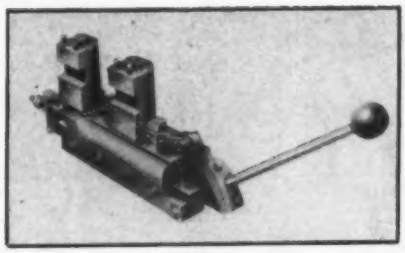
Once such a device was considered a scientific research instrument. Today, Michigan Tool Company employs it in routine production control to assure that the cutting tools it produces for the war effort will be the finest it is possible to make.

ORIGINATORS of GEAR SHAVING

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD • DETROIT 12, U. S. A.

BUY U.S. BONDS STAMPS

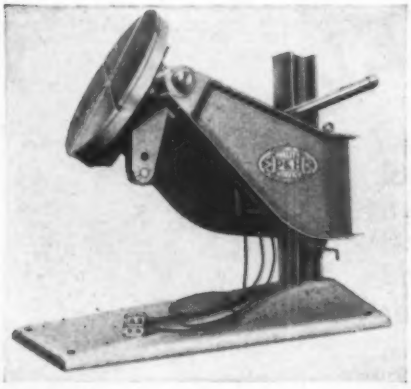


General Cross-Slide Attachment Will Fit Most Bench Lathes

General Die-Stamping-Tool Co., 265 Canal St., New York 13, N. Y., is offering a lever type cross-slide for such operations as cutting off, forming, chamfering and grooving. This attachment is available in three models, for 10 in. Atlas and Logan and for 9 in. South Bend lathes. However, it can be adjusted to fit most other bench lathes. This cross-slide measures 9¾×3½ in., and 2½ in. high. Weight is 32 lb. Capacity of this equipment is 2½ in.

The attachment has double-acting stop controls for the travel. Two toolposts, adjustable in two directions, accommodate bits from ¼ to ⅞ in. A leveling device, which maintains the tool in horizontal position, is provided on the toolpost. The handle can be moved in three positions for convenience of the operator.

Harnischfeger Makes Welding Positioner With Dual Capacity



Welding positioners featuring dual capacity rating have been made available by Harnischfeger Corp., Milwaukee 14, Wis. The equipment is made in models up to 24,000 lb. capacity. Model WP-6 illustrated is in the 6,000 lb. class and handles loads up to 6,000 lb. maximum and also has a secondary capacity of 9,000 lb. maximum. These positioners are supplied for alternating or direct current, and with portable or floor mounting.

A large table top area is provided on the equipment. Table turning is accomplished by pinion from an inclosed flood-lubricated gear case to the bull gear to which the table top is bolted. The table can be quickly removed for bolting special weldments or fixtures directly to the bull gear. The table motions are operated by remote control with individual magnetic pushbutton stations to two separate motors for tilting and turning. Free-running elevation of the table by hoisting is provided by a roller-equipped yoke with self-locating stops. By placing the elevator columns farther back the design provides clearance for handling large weldments. A self-locking worm gear and spindle drive on the tilting motion prevents upsets. A limit switch and adjustable stop brackets give additional safety when extreme tilting is necessary.

Auxiliary equipment available includes a self-leveling platform for the operator, variable speed for table turning and power elevation.

Sheffield Comparator Checks Inside and Outside Dimensions

An instrument for precision measuring of internal and external dimensions held to close tolerances has been built by Sheffield Corp., Dayton, Ohio. As an internal dimension comparator, this instrument can be used for checking master and working ring gages, for setting snap and length gages, and for similar high precision work. It will check diameters or other internal dimensions from ¾ to 12 in., and explore a hole to a depth of 3 in. An open hole may be checked to a depth of 3 in. from one side, and the piece turned over and an additional check of 3 in. made from the other side. This equipment will also measure taper, bellmouth and out-of-roundness.

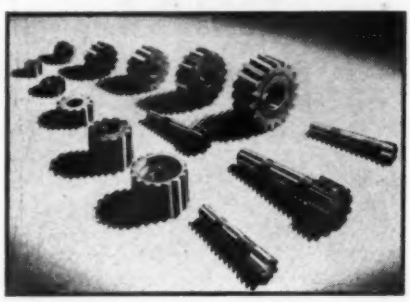
When used as an external comparator, it will check rounds, straights and tapers within a maximum dimension of 12 in.

The gaging arms are raised and lowered by an electrical mechanism operated by two pushbuttons. Automatic stops prevent the arms from exceeding the 3 in. range limits. The height of the gaging arms above the lapped table surface is shown by a direct-reading visual counter, graduated in 0.01 in. The electric gaging head provides electrical magnification of 2500 to 1. The scale of the Electrigage has a range of 0.0012 in., and is graduated in 0.000050 in.

These 50-millionth-inch graduations are spaced far enough apart so that interpolated readings of 0.0000125 in. are possible.

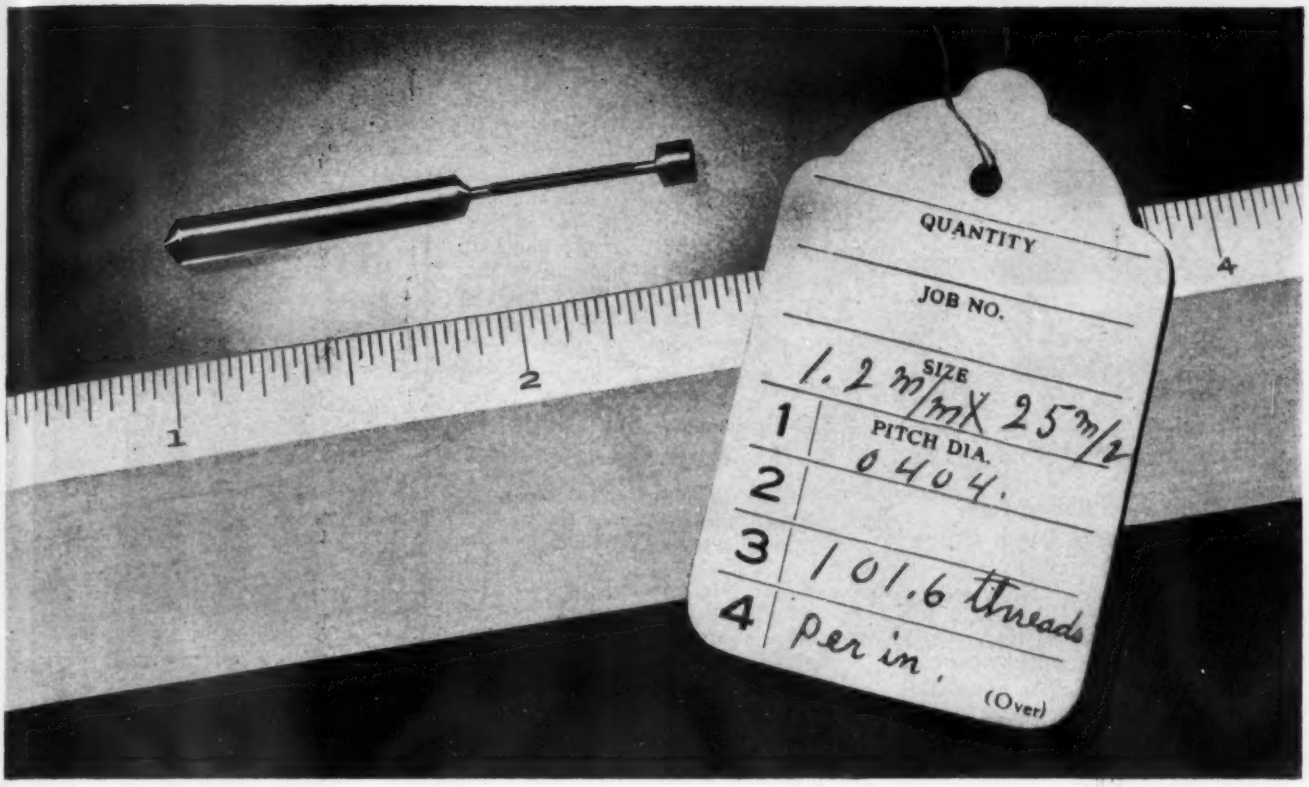
Detroit Tap Stocks Blanks For Thread Milling Cutters

Detroit Tap & Tool Co., 8432 Butler, Detroit, 11, Mich., is now carrying in stock a line of standard blank sizes of thread milling cutters that are finish-machined and heat-treated, ready for finish grinding of threads. Included in the line are both shell and shank type cutters. Diameters of the 40 shell type blanks range from 1½ to 3½ in. The 1½ in. diameter blank has eight flutes; those from 1¾ to 2 in. diameter have ten; those from



2¼ to 2½ in. diameter have 12; the 3 in. diameter blanks have 14; and the 3½ in. diameter blanks have 16 flutes. Face widths vary from ½ to 2 in. Hole sizes correspond to standard thread milling machine arbors. All shell type blanks have right hand spiral flutes and a 5 deg. rake angle.

Twelve shank type blanks are available, ranging from ¾ to 1½ in. in diameter. Blanks from ¾ to 1 in. diameter have six flutes; those from 1 to 1½ in. diameter have eight flutes. Face widths vary between 1 and 1½ in. Shanks range from 3½ to 5 in. in length. All of these blanks have right hand spiral flutes and a 5 deg. rake angle.



101.6 threads per inch . . . chased on a Monarch Lathe!

If you're troubled with thread chasing on very small jobs like this one, take a lesson from this manufacturer and do them on a Monarch 10" Precision Toolmaker's Lathe.

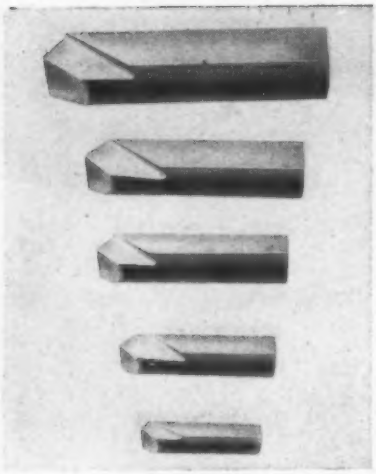
For this job, the gear train carries special gears for 101.6 threads per inch. The lathe is also equipped with Monarch's electric leadscrew reverse and rapid return. Threads are chased toward the headstock at 425 rpm., and with leadscrew reverse controls on the apron, the carriage is returned to the starting position at 1000 rpm., or faster if desired.

Thus, the thread chasing is done accurately, and valuable production time is saved by the young woman operator who does the job.

This example is just one of a wide variety of close tolerance work which can be done on Monarch 10" Precision Toolmaker's Lathes. If you think you have jobs which these machines might do more quickly and accurately than by your present methods, we'll be glad to work with you.

THE MONARCH MACHINE TOOL COMPANY · SIDNEY · OHIO

MONARCH LATHES
Save Time



Kennametal Solid Round Tools Now Available Ready-Ground

Kennametal, Inc., 103 Lloyd Ave., Latrobe, Pa., is offering a line of solid round Kennametal tools that are ground ready for use in precision boring machines. The 27SR tools have a side cutting edge angle of 30 deg., and end cutting edge angle of 38 deg., while the 29SR tools are available with corresponding angles of 45 and 53 deg. The former line is for use primarily in a 30 deg. boring bar, and the latter tools are intended for use primarily in a 45 deg. boring bar.

Five sizes are available in each style, 3/32, 1/8, 5/32, 3/16 and ¼ in. Tolerances are held to +0.000 and −0.001 in. on the diameter, and to +0.000 and 0.005 in. on all other dimensions. The tools are stocked in grades K3H and K4H.

Shape-Rite 8-In. Stroke Shaper For High-Speed Finishing

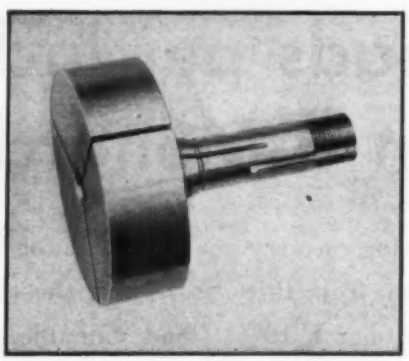
An 8-in. stroke Hy-Duty Shape-Rite shaper for producing a fine finish at high-speed is being offered by Sales Service Machine Co., 2426 University Ave., St. Paul 4, Minn. This machine can be furnished with either a plain or swivel table. The latter is graduated in degrees and may be swiveled to 180 deg. V-type ram ways allow operation up to 160 strokes per min.

Horizontal table travel is operated by a ratchet connected to the bull gear shaft. Travel is from 0 to 0.025 in. The table vise has a swivel base and is graduated to 190 deg. All gears except the bull gear and pinion are enclosed and operate in oil. The bull gear and pinion are cut right-hand helical angle, and the drive gear is cut left-hand angle. Gears and drive shafts are mounted on anti-friction bearings.

G-B-M Universal Collet Chuck For Second Operation Work

For second operation lathe work, Gilbert-Baker-Midlam Co., 38 North Jefferson St., Dayton 2, Ohio, has brought out a universal collet chuck. It will handle diameters from ½ to 2¾ in., and thickness of the head permits its use for a number of different jobs by boring each recess an added depth. While this chuck is especially suitable for 10 in. Atlas and Logan lathes, it will fit the collet attachments of most lathes. It is also applicable to most milling machines using draw-in collets.

The shank and tapered shoulder are

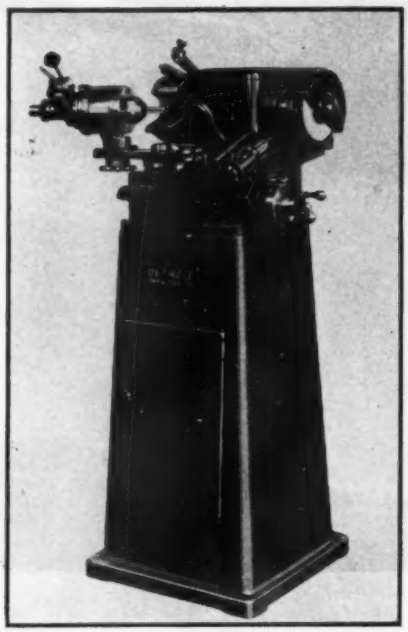


hardened, but the 3 in. diameter head is cold rolled steel. With the chuck held in the lathe, a recess is bored in the head to accommodate the work to be held. The bored areas of the three head segments form the jaws of the chuck, which grip the work when the drawbar pulls the tapered shoulder against the closing sleeve.

Detroit Tap Reconditioner Meets Various Service Factors

An improved tap reconditioner has been brought out by Detroit Tap & Tool Co., 8432 Butler, Detroit 11, Mich. The improved design features a spindle head which accommodates interchangeably a wide range of motor types for the various service voltages, phases and frequencies. This reconditioner will accommodate collets from the smallest machine screw size up to 1¼ in. tap shank size, including long shank taper taps.

Rigidity of the spindle head plus continuous adjustability for grinding tool wear is obtained by mounting the spindle assembly on large dove-tail ways in the pedestal base. Spiral pointing and spiral point polishing operations can be performed by integral units of the machine, the former driven from the spindle. The ½ hp. spindle motor is controlled by a



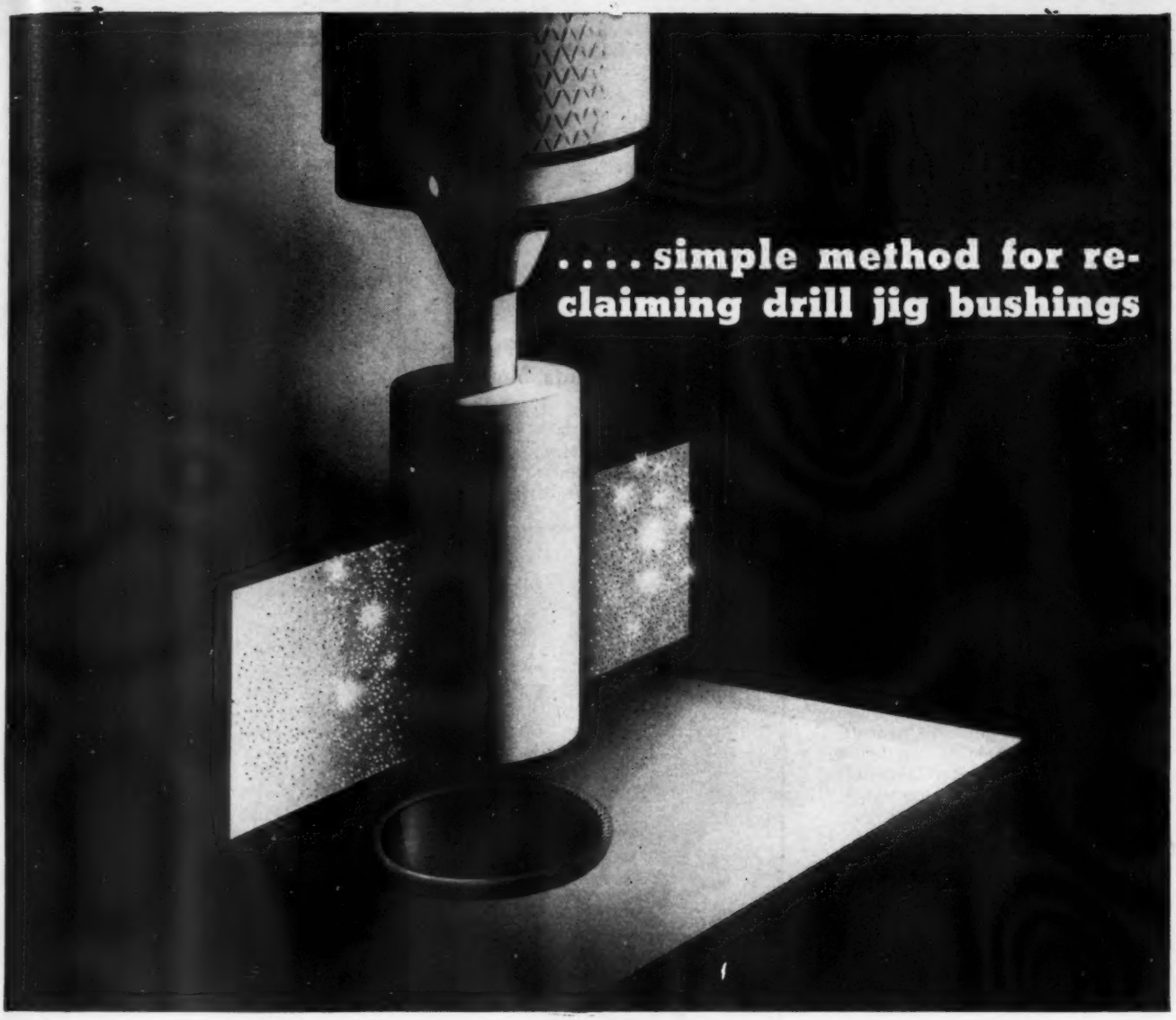
manual switch mounted in the base. It is internally wired, terminating in a line switch at the base. Standard motors for the reconditioner include 220 or 440 volt, 3 phase, and 110 volt, single phase, for either 25 or 60 cycle service. The range of possible motor sizes permits faster deliveries.

Elemoto Slide Chart Shows Many Standard Measurements

A revised slide chart has been designed by Elemoto Sales Co., P. O. Box 62, Teaneck, N. J., to help engineers and draftsmen in their work. The front of the chart shows standard dimensions for coarse and fine thread series. When the slide inside the housing is moved to the right or left, standard dimensions for each size from 0 to 1¼ in. are shown at the windows in the blueprint dimension drawings. All required dimensions, such as threads per inch, major and minor diameters and head sizes are quickly obtained with one reading. This side of the slide housing also carries decimal equivalents of fractions and a table of U. S. standard gages for steel sheets.

The reverse side is used to obtain dimensions for U. S. standard, and other commercial sizes, Woodruff keys. The lower section of the chart provides dimensions for American standard pipe threads. The housing on this side also carries a table for changing millimeters to inches and a table of twist drill and steel wire gages.

This chart features two-color slide and a washable surface.



Information furnished by an Industrial Publication

The interior surface of drill jig bushings can be injured in several ways: by galling, burning, or seizing of the drill. In one manufacturing plant a simple but very effective method has been developed for restoring the surface by honing.

The equipment consists of a mandrel and a piece of abrasive cloth. The mandrel can be made from scrap rounds or cut-offs. The body is turned down to a diameter slightly less than that of the bushing, and the shank machined to fit into a conventional drill chuck.

The body is slotted at the bottom to take a piece of abrasive cloth somewhat wider than the depth of the bushing. The cloth is wrapped around the mandrel and the assembly started in the hole before power is applied.

If a coolant or oil lubricant is used, the bushing can be "honed" by moving the mandrel up and down as it rotates. As the hole enlarges, or as the "gall" is removed, additional pieces of abrasive cloth can be caught under the original piece to enlarge the hole still further.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E ★ NAVY

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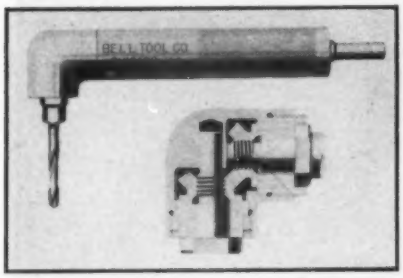
Climax Mo-lyb-den-um Company
500 Fifth Avenue • New York City

MOLY

Bell B-90 Deg. Angle Head for Use With Small Portable Tools

Bell Tool Co., 710 West Jackson Blvd., Chicago 6, Ill., is making the Bell B-90 deg. angle head tool for use with a flexible shaft or other small portable tool. It will take adapter-mounted bits for drilling, burring, reaming, countersinking, rotary filing and light grinding. This angle head tool is 1-5/32 in. high and 5-5/16 in. long, including power receiving shaft.

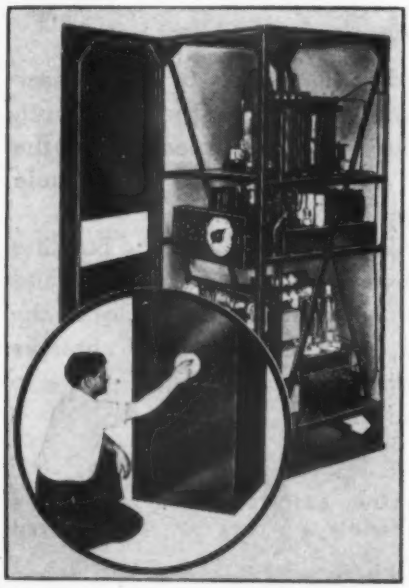
The tool features miter gear design that is said to provide high internal strength and long operating life. The



sleeve of each miter gear has a large bearing surface to maintain the initial true alignment of spindles and gears for many hundred hours of operation. This angle head tool is particularly suited for close quarter production work where tool space is limited.

CML 1400 Electronic Generator Provides Wide Frequency Range

Frequency range of 300 to 3,500 cycles is provided in the CML 1400 electronic generator made by Communication Measurements Laboratory, 120-24 Greenwich St., New York, N. Y. This



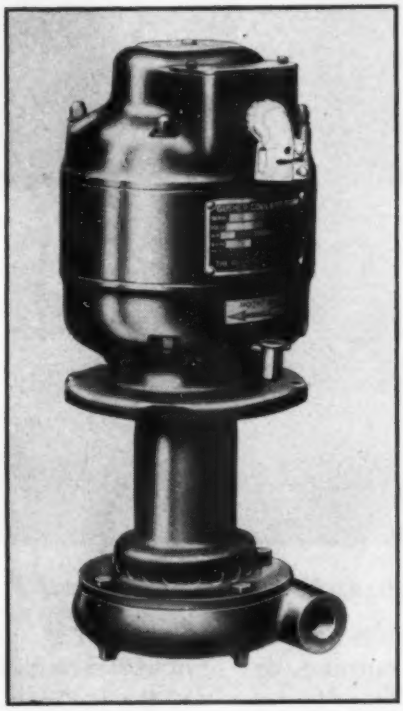
unit serves a versatile source of power for tests on the production line. In addition to plant and laboratory applications, the generator is suited for maintenance and field service work. It may also be used for testing transformers and condensers. Power output of CML 1400 is 1,400 watts at 120 volts, with a load at unity power factor.

This electronic generator includes a variable-frequency oscillator, followed by several driver stages. The output stage employs a pair of 833-A tubes in class B. A special control circuit maintains output voltage at a constant level from no load to full load.

This unit proves especially valuable where complete tests through a wide frequency range are required.

Ruthman Immersed Type Pump Suited for Bedplate Mounting

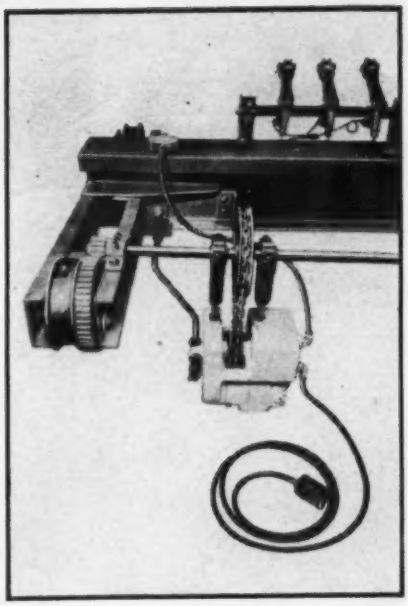
Model 9040 immersed type motor driven Gusher pump has been produced by Ruthman Machinery Co., 1819 Reading Road, Cincinnati, Ohio. The unit is designed for installation



interchangeability with the Model 1-P3 pump, and is available in any current characteristics, including 25 cycles, 1, 2, or 3 phase. This model is made in two lengths. Dimensions from the mounting flange to the bottom of the pump are 6-7/16 and 8-7/16 in. respectively. The pump is available in ½ or ¾ in. pipe size discharge. The ¼ hp. operating motor is totally inclosed, with one-piece shaft which extends to the pump impeller. This pump is equipped with integral flange bracket for reservoir cover or bedplate mounting.

Budgit Bridge Drive Converts Crane to Electric Operation

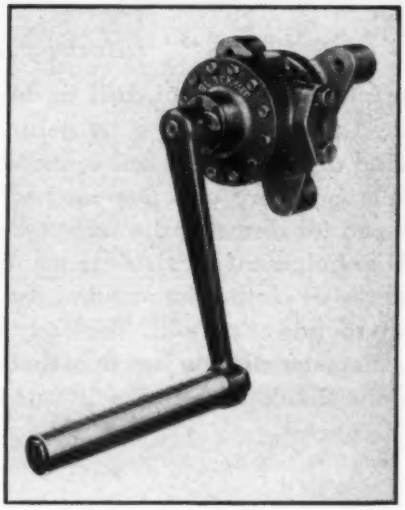
To convert bridge travel motion of hand-operated cranes to electric drive, Manning, Maxwell & Moore, Budgit Products Div., Muskegon, Mich., has produced the Budgit bridge drive. This unit is self-contained and may be



quickly installed on a crane without drilling or fitting. The drive is suited for either single or double girder type of ten-ton capacity or smaller, providing the crane is the geared type and operated by a chain wheel of 24 in. diameter or smaller. Pushbutton controls the Budgit drive.

Blackmer Rotary Hand Pump For Hydraulic Control Devices

An all-bronze rotary hand pump that develops a pressure of 125 lb. per sq. in. has been produced by Blackmer Pump Co., Grand Rapids 9, Mich. The unit is known as a Dead Ship starting pump, and has capacity of 1.5 gal. per

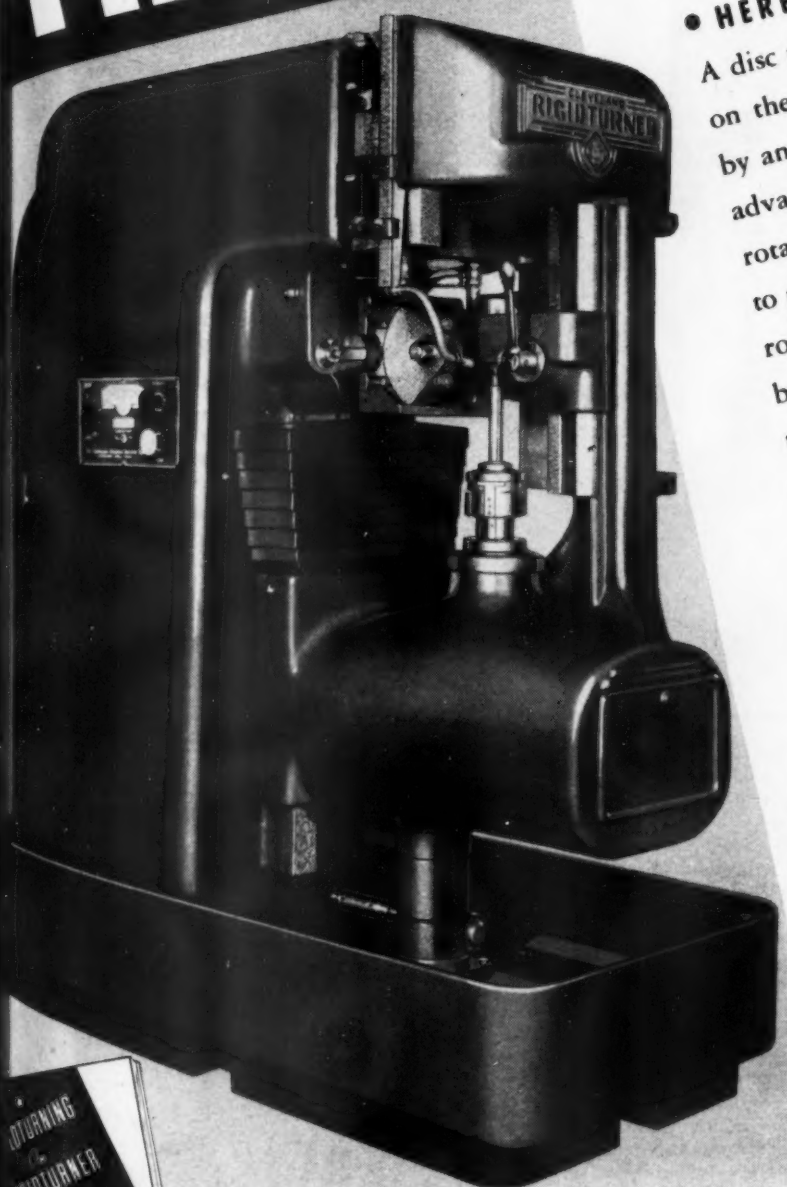


min. It has high pressure hand pump application on a ship, such as for handling certain types of lube oils and fuels. Industrial and commercial applications of the pump are confined chiefly to hydraulic control devices and other equipment where high pressure, hand operated pumping units are required.

This pump is now a standard unit in the Blackmer line.

For PRECISION TURNING OF MULTIPLE DIAMETERS

THE RIGIDTURNER



This booklet gives complete information on how the Rigidturner works and how it can reduce your costs on multiple diameter turning. Write for a copy today.

• HERE'S HOW IT OPERATES

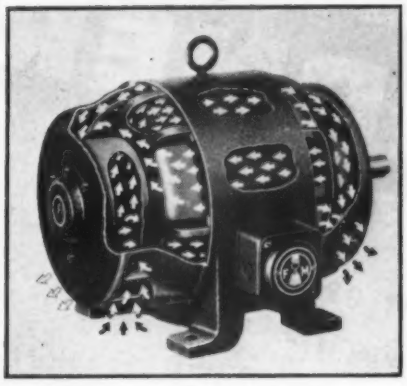
A disc type form cutter is mounted on the cutter arbor and supported by an outboard support. The work advances past the cutter which is rotated in variable timed relation to produce different diameters. The rotation of the cutter is controlled by a cam moving a follower attached to a rack meshing with a gear on the cutter spindle. One complete pass of the cutter completes that operation.

• OFFERS DEFINITE ADVANTAGES

Requires no skilled help—more operating minutes per hour—less changeover time—accurate duplication—adaptable to long or short runs—longer cutter life—less floor space—greater production at lower cost—adaptable to any type of shaft turning.

• **CONSULT A C H ENGINEER** on the economy of using the Rigidturner for turning multiple diameters.

The CLEVELAND HOBBING
Cleveland ... MACHINE Company ... Ohio



Fairbanks-Morse Motor Has Cross-Flow Ventilation

Fairbanks-Morse & Co., 600 South Michigan Ave., Chicago, Ill., has produced a general purpose, continuous-duty, polyphase squirrel-cage induction motor which is fully protected against flying chips, dripping liquids and other hazards. Cross-flow ventilation is featured in frames 224 to 365. It is obtained through protected inlets and exhausts at each end of the motor, and provides uniform cooling and the elimination of hot spots. This motor is rated 40 C. and has a 1.15 percent service factor.

The frame is cast in one piece with the rib sections. Where space is limited, the conduit can be brought up between the motor feet to the tapped hole in the motor frame, and the conduit box cover assembled flush with the frame.

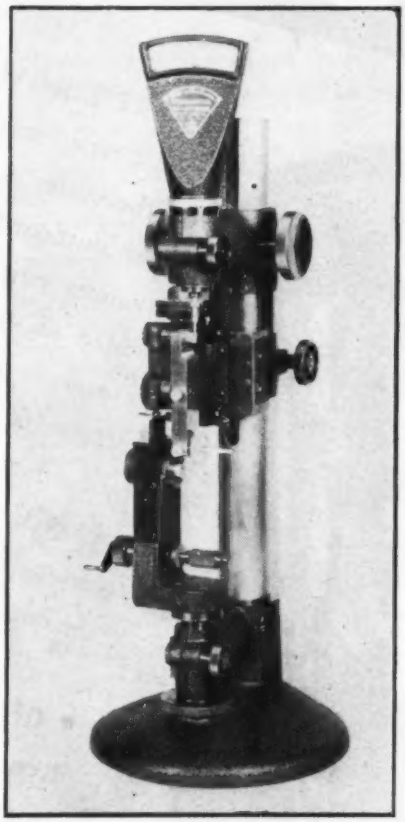
The prewound stator core is made up of punched laminations. Wire or cotton covered enameled wire is used in the coils, and extra insulation is placed between phases. Slot cells, consisting of two layers of heavy insulation with a layer of varnished cloth between, protect the stator windings. Slot cells are folded on each end to provide added strength and to lock the cells in place. All windings are impregnated with moisture-resisting plastic insulating varnish.

Bakelite Produces Several Black Molding Plastics

Several phenolic molding plastics, which help save the supply of phenol, have been developed by Bakelite Corp., 30 East 42 St., New York, N. Y. Physical characteristics as indicated by tests of these materials are shown in the table below.

Scherr Comparitol Gear Tester Detects Faults During Process

George Scherr Co., 128 Lafayette St., New York, N. Y., has developed the Comparitol gear tester. This unit has a range of 1 to 6 in. center distance, with special attachments available for checking to the smallest center distance. This gear tester detects and



locates faults during the manufacturing process, and is also used to check accuracy of gears when completed.

The comparator head provides readings of 0.001, 0.0005, 0.0025 or 0.0001 in. This tester will show up rolling action between two working gears or gear and pinion. This instrument is of vertical construction and occupies little bench space. Center distance may be quickly checked by setting up the instrument to the proper distance with gage blocks or standards. The master gear is placed on one arbor, and the gear to be tested is placed on another arbor and in direct contact with the master. The master gear sprocket is provided with a counterbalance, which can be adjusted for uniform pressure between the master gear and the gear being tested. A handle used to rotate the gears is located beneath the gear under inspection. The instrument may also be employed to check for runout in gear train assemblies.

Agatex Concrete Floor Patch Resurfaces Holes and Breaks

Agapatch concrete floor patch is being offered by Agatex Corp., 1170 Broadway, New York 1, N. Y., for repairing and resurfacing breaks, holes, ruts and irregularities in concrete floors. It is claimed that this material is imper vious to the effects of lactic and other acids, oils, strong alkalis, greases and heavy trucking.

Agapatch comes in a dry form, and by adding water a mortar or paste is formed. It can be applied on dry or wet floors in any thickness from ½ in. to unlimited depths. After six to eight hours the application is ready for traffic.

Matthews Marking Machine Handles Flat or Round Parts

For marking numbers, names, special lettering and the like on parts up to 6 in. in diameter or thickness, Jas. H. Matthews & Co., Pittsburgh, Pa., has developed a No. 204 general purpose marking machine. Almost any flat or round part can be handled on this equipment. It has a die stroke of 3½ in. on round parts, and 4½ in. on flat parts. Table size is 9x8 in., and rise of the table is 7 in. The throat distance from the center of the die to the front of the uprights is 3½ in., with opening of 8 in. between the uprights. The machine occupies a floor space 19x20 in., and is 52 in. high. It weighs 500 lb.

Flat parts are marked by means of roller dies or mortised roller dies and interchangeable segment type. Round parts are marked with flat dies or

	BM-16325 black	BM-16749 black	BM-16785 black	BM-16894 black
Flow at 500	40-140	40-70	70-120	40-100
Preheat time	68-85	65-75	65-75	60-70
Apparent density	0.50-0.54	0.52-0.55	0.52-0.55	0.53-0.56
Specific gravity	1.35-1.39	1.39-1.40	1.39-1.40	1.40-1.41
Shrinkage	0.005-0.007	0.005-0.006	0.005-0.006	0.005-0.006
Preforming	good	good	good	fair
Stripping	good	good	good	fair
Flexibility at 90 sec.	0.20-0.40	0.25-0.35	0.30-0.40	0.15-0.25

DESTRUCTION . . . *made to order*

AMONG ALL the missiles man has contrived to hurl death at his enemies, the torpedo is unique.

No other projectile is so complex, so carefully engineered, so "made to order" for destruction. Driving the deadly "warhead" is an intricate mass of motors, shafts, instruments—and *bearings*. Ball bearings—without which neither motors, shafts, nor instruments could "do their best work."

The torpedo is one more illustration of the fact that there is no more vital factor in the mechanized war we fight today than anti-friction bearings. They literally *make possible* the *sustained* action of our more important tools of war.

New Departure is making bearings by the tens of millions. In fact New Departure has a major responsibility in the whole ball bearing war production program.

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THE TIME IS NOW

Bearing application is a highly specialized art. Wisdom dictates consulting our engineers on new designs while yet in the formative stage.

NOTHING ROLLS LIKE A BALL

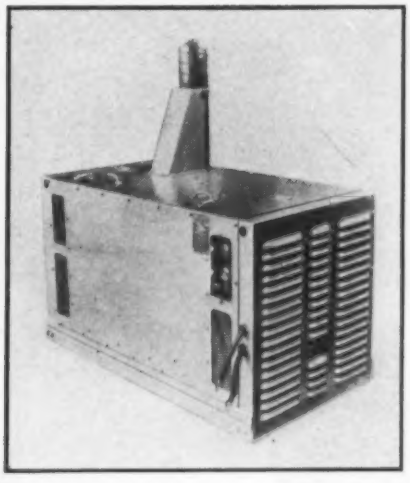
New Departure

THE FORGED STEEL BEARING

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

interchangeable steel type. The part to be marked is placed into a suitable fixture, fastened to the table of the machine, and the treadle depressed. Movement of the treadle raises the table and brings the part into contact with the marking die. When the handle is pulled downward, this causes the die to move across the part for marking. A pneumatic air cylinder can be installed in this machine for greater ease in operation.

Ready-Power Gas-Electric Unit Built for Heavy-Duty Truck

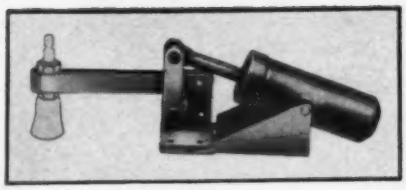


Model J heavy-duty gas-electric power plant is being made by Ready-Power Co., 3828 Grand River & Avery St., Detroit, Mich., to supersede its Model G unit. The new model is smaller in size but with greater power capacity. It is built for 10 to 30 ton electrical industrial trucks.

The unit consists of a gasoline engine coupled to a direct current generator. It is complete with all accessories mounted in a steel housing for fastening to the truck chassis. Electric power is thus generated on the truck and delivered to the truck motors through the standard electric truck control mechanism. The equipment has a hinged cover at the top, with a similar cover at the front to provide access to the parts. All engine accessories are readily removable. Automatic idling, obtained through the syncontrol governor, is said to save fuel and engine wear. Other units are available for smaller capacity trucks.

Airop Toggle Clamp Device Controls From Central Valve

A device called Airop, intended for activating toggle clamps, has been developed by Airop, Inc., Dearborn, Mich. It will hold down large parts or assemblies where clamps are required to encircle a job, such as in the case of airplane wings. A gang of Airops placed around the perimeter can be controlled from one central control valve. All the clamps can be made to operate simultaneously or at staggered intervals, according to the requirements of the work. This usage eliminates the necessity for the operator to walk around the work to manipulate the clamps. Airop weighs 1¾ lb. in locked position. The device operates on shop airline pressure of 40 to 150 lb. It is capable of withholding a constant pressure of 325 lb. at the end of the clamping bar.



A 90-deg. swing of the clamping bar from closed to opened position facilitates placing and removing of parts in the fixture. A single action spring return actuates the toggle clamp. The clamp has a slotted bar which permits horizontal as well as vertical adjustment of the pressure spindle. It holds parts of more than one thickness, and by using additional spindles a part of varying thickness can be held. Airops may be set up for foot operation where operator must use both hands to guide work.

Allis-Chalmers Produces The Ampac 400 Welder

Ampac 400 welder has been developed by Allis-Chalmers Mfg. Co., Milwaukee, Wis. This 400-amp. size equipment will handle ¼ in. electrodes, and has capacity for rods up to ⅜ in. The unit is also adaptable for automatic welding. It has a range of 50 to 500 amp. with power factor correction available if desired. Features claimed for the machine are low idling loss, high power factor and high efficiency over the entire range. Only eight turns of the control handle are required to cover its entire range.

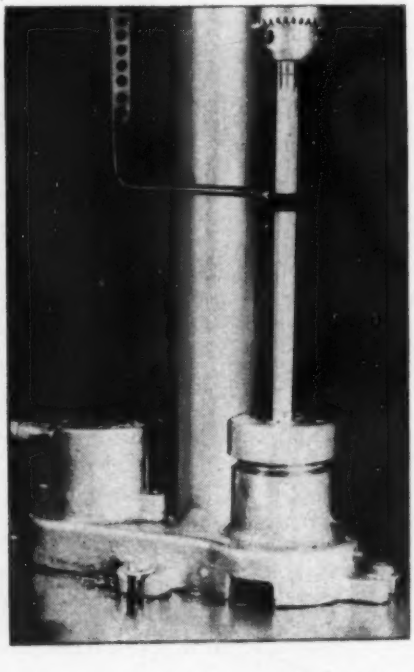
Paasche Produces Airbrush Which Heats Air and Material

Paasche Airbrush Co., 1909-1923 Diversey Parkway, Chicago 14, Ill., has available a Type F974 electrically heated airbrush which heats both air and material. Heat is thermostatically controlled from a low of 180 F. to a medium of 260 F., and a high of 320 F. Any size and type of spray may be obtained by turning the calibrated dial control. The unit requires 10 to 30 lb. of air pressure for maximum efficiency. Materials may be applied wet or

dry. Cleaning and filling are made easy by the cup with a 3⅝ in. opening and removable snap-on cover. The airbrush operates on 110 volts a.c.

Red-E-Air Collet Chuck For Second Operation Work

The Red-E-Air collet holding fixture is being made by Red-E-Air Chuck Co., 654 West Lake St., Chicago 6, Ill., and distributed by Cleveland Airtool Co., 4614 Prospect Ave., Cleveland 3, Ohio. This No. 0 chuck is air operated, and takes work up to ⅞ in. in diameter. It is suited for chucking screw ma-



The Battle Song of Steel

Steel is a song of work that has been set and sung to many scores in the long history of its development and production.

★ ★ ★

The tune and tempo are martial now and, in stirring rhythm, it is sung by the work and sweat of more than six hundred thousand men of steel throughout this land . . . day and night, day in and day out . . . as they break record after record in turning out millions upon millions of tons of fighting steels for our fighting men. It is sung by production at the ore pits . . . the coal mines . . . the quarries . . . on rail, lake, and river. It is sung by all-time high production records at the coke ovens . . . the blast furnaces . . . the steel furnaces . . . the rolling mills and other finishing mills. It swells to a mighty chorus of loyal, hard work that converts the good, red earth, that is iron, into the many steels that become the guns, the ships, the tanks, the planes, the bombs, the shells to arm our sons and brothers . . . protect their lives . . . as they invade and crush the enemy.

★ ★ ★

So is the battle song of steel sung by work in the war of the world . . . for this is a war of steel . . . and by virtue of enterprise, ingenuity and rich natural resources . . . America is the great arsenal of steel . . . the overwhelming producer of steel. And because America sings the song of steel at work for war in increasing volume . . . with deep-throated purpose . . . a determined will to do . . . our fortunes are on the rise and the dawn of peace is seen from the heights of hope.

★ ★ ★

Of steel at war we sing. With steel we fight. With steel as the basic means we unleash a host of other lighter metals and materials for waging war . . . for invasion from the air . . . from the sea . . . and by land . . . so that our coordinated services shall have every weapon needed to forge the victory.

★ ★ ★

When that gage is won and the peaceable kingdom ushered in . . . the song of steel will be set to the score of service . . . with all its accumulated skill and far-sighted science . . . sharpened by the fiery experience of war . . . devoted to the creation of better things for better living for all mankind.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

J&L STEEL

CONTROLLED QUALITY STEEL FOR WAR

J&L STEEL

chine parts for second operation work on drill presses, tapping machines, milling machines and other machines where the operation should be concentric with the chucking surface.

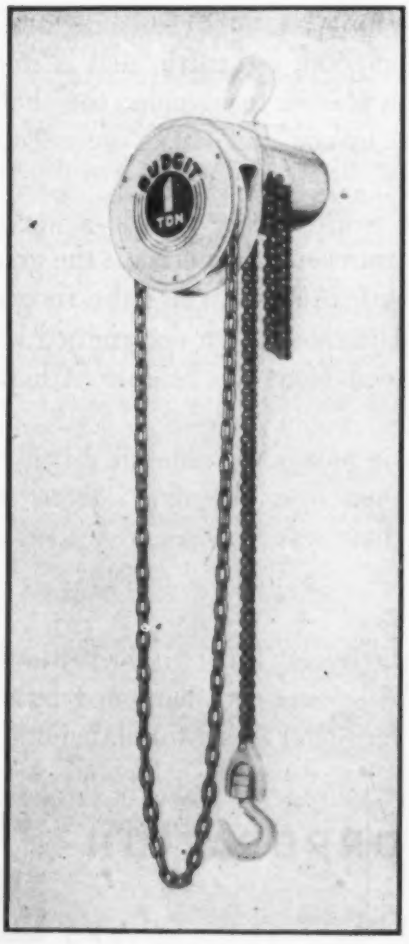
Base dimensions of the Red-E-Air chuck are 9½×4¼ in. It has an over-all height of 4½ in. at the collet, and base dimensions are 11½×5 in., including lugs. By changing the collet and stop many different jobs can be performed with this chuck.

The fixture is operated by a foot valve, leaving the operator's hands free to load and unload. Holding pressure of the chuck is 1,325 lb. at the collet on a 100 lb. air line. Where lower pressures are required, a reducing valve or pressure regulator is used.

Manning, Maxwell & Moore Makes Line of Budgit Chain Hoists

A line of high-speed spur geared Budgit chain hoists in ¼ to 2 ton lifting capacity has been marketed by Manning, Maxwell & Moore, Budgit Chain Block Div., Muskegon, Mich. The ¼ and ½ ton capacity hoists weigh 48 lb. The 1 ton hoist weighs 59 lb., while the 2 ton unit weighs 81 lb. These hoists feature light-weight construction.

The units have anti-friction bearings on shafts, and have roller type lift chain. Automatic load brake and mechanism operate in a grease-packed inclosure. A chain guide prevents the hand chain from fouling the wheel.

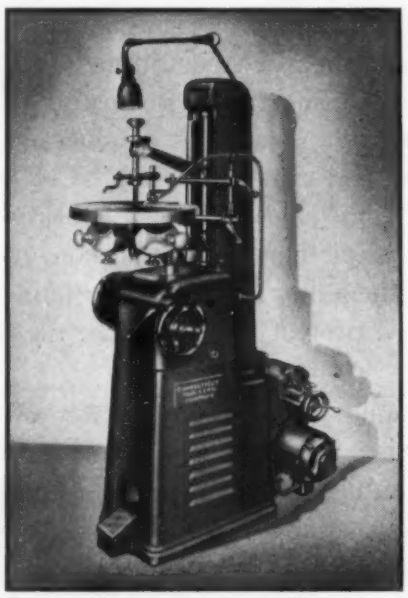


Connecticut Filing Machine Has 20-Deg. Tilting Table

The Connecticut universal filing machine is being built by Connecticut Tool & Engineering Co., 544 Iranistan Ave., Bridgeport, Conn., for precision filing of dies, fixtures, punches, stripper plates, forging and drawing tools, templets for aircraft, cams, gages and general machine work on any angle up to 20 deg.

Work with a maximum thickness of 4½ in. can be accommodated on this Model FI machine, which has a throat opening of 10⅞ in. and maximum stroke of 5 in. Over-all dimensions of the machine are 45×45×66 in. It weighs 800 lb. This model is equipped with a ½ hp. motor with infinite speed regulations available. Starting and stopping is by means of a foot pedal switch built into the base. The machine will file lengths from 4 to 10 in. An air pump delivers a continuous stream of air directly to the work independent of the machine speed.

The table, which measures 17 in. in diameter, is ring fluted for easy elimination of file dust. It can be tilted

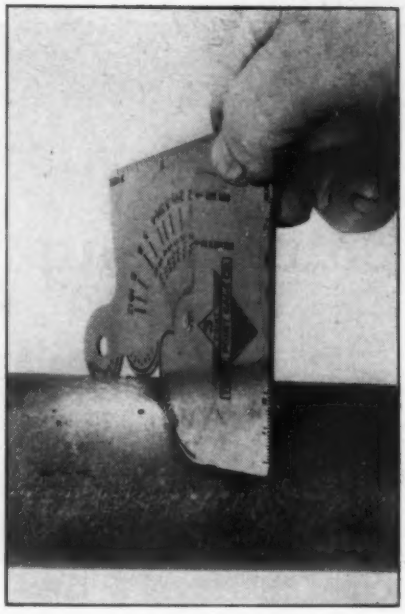


20 deg. in any direction by a cradle and rocker arrangement operated with a rack and pinion; and can be raised or lowered by means of a handwheel. Work is held by two hold-down arms and fingers that may be adjusted and swiveled in any direction to accommodate the work. The vernier scales read up to 10 min.

Three-Point Pocket Gage Measures Pipe Up to 12 In.

For measurement of all sizes of pipe from ⅛ to 12 in., Three-Point Gage Co., 3821 Broadway, Chicago, Ill., has brought out a vest pocket size gage. It measures 2½ × 4¼ in. when closed. This steel gage has deep etched numerals.

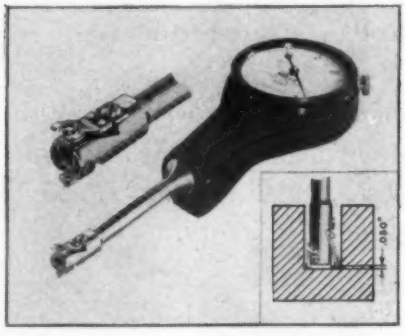
The gage consists of two pivoted



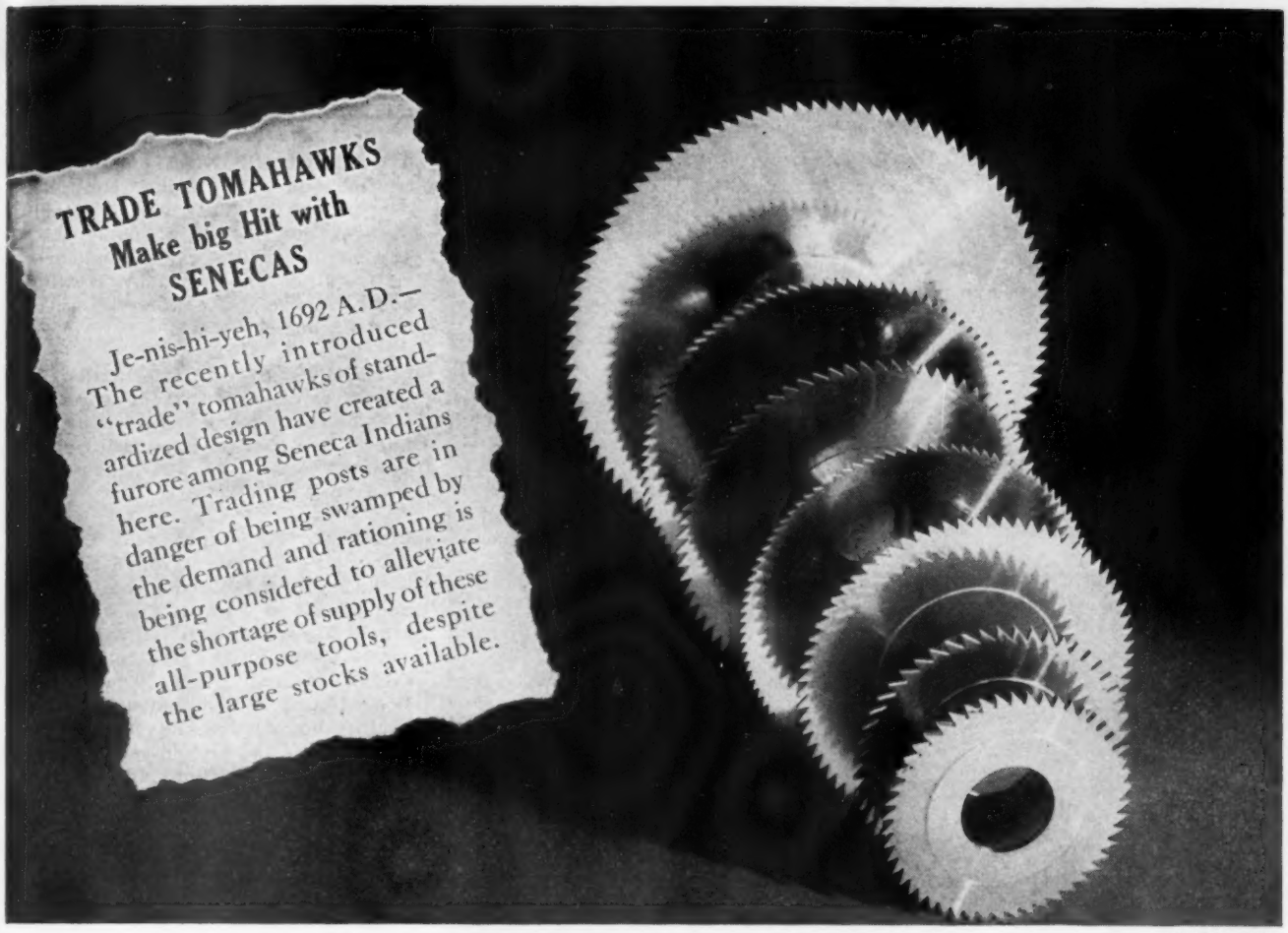
plates with edges curved at three points for contact with the pipe to be measured. The device provides a method of determining the outside arc of the pipe at three points of contact. By placing the two fixed contact points of one plate against the outer contour of the pipe and adjusting the movable plate until it makes a third contact, the marker on the face of the gage shows the pipe size. Pipe may be measured in any position, and it is necessary to contact only a small section of the pipe contour.

Federal Blind Hole Gage Inspects All Size Diameters

For inspecting holes of all sizes from ⅛ in. diameter up and of various lengths, Federal Products Corp., 144 Eddy St., Providence, R. I., has available Model 1201 P-20 blind hole gage. The instrument checks inside diameters to within 0.030 in. of the bottom



of blind holes. All moving parts in gaging head are spring suspended. There are no bearings or bushings. Two auxiliary locating contacts centralize the measuring contacts diametrically across the center of the holes. The indicator contact points range from −0.005 to +0.003 in. Gage measures direct and can be set to a master, gage blocks or micrometer.


TRADE TOMAHAWKS
Make big Hit with
SENECAS
Je-nis-hi-yeh, 1692 A.D.—The recently introduced "trade" tomahawks of standardized design have created a furore among Seneca Indians here. Trading posts are in danger of being swamped by the demand and rationing is being considered to alleviate the shortage of supply of these all-purpose tools, despite the large stocks available.

No. 7 in a series

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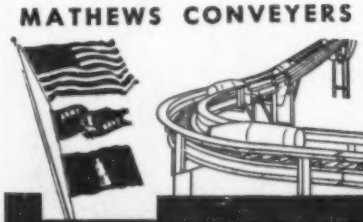
America's war industries from coast to coast are improving their per-man-and-machine-hour production schedules with the aid of Mathews Time-Coordinated Conveyer Systems.

MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION



If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

MATHEWS CONVEYER COMPANY ELLWOOD CITY PENNSYLVANIA

TRADE PUBLICATIONS

AIR CONDITIONING The gains to be realized through having controlled temperature, humidity and air cleanliness are described in a booklet 3AC-0201 on air conditioning and industrial refrigeration, announced by Westinghouse Electric and Manufacturing Co., East Springfield, Mass.

CLEANING Specific information for executives responsible for the maintenance of power plant equipment is contained in a 16-page digest released by Oakite Products, Inc., 24 Thames St., New York 6, N. Y.

CONTROL The amplidyne, a G-E engineering development which harnesses the usually troublesome short circuit and puts it to work, is the subject of a new 36-page bulletin (GEA-4053) recently issued by the General Electric Co., Schenectady, N. Y. The publication describes comprehensively the engineering details and fundamental functions of the amplidyne, lists several typical applications and in many cases cites figures showing the gain in production levels through its use.

CONVERSION How "Caterpillar" products of peace became tools of war almost overnight is told in a new booklet, "War and Peace," published by Caterpillar Tractor Co., Peoria, Ill.

COOLANT COOLER A two-page, illustrated technical bulletin No. 75-AC describing the new Frostode coolant cooler has been released by Frostode Products, 19003 John R. Street, Detroit 3, Mich. Complete specifications and an illustration of a typical installation are included.

DERMATITIS "Are Yours Fitted for Fighting" is the title of a folder published by Prack Laboratories, Inc., 132 West 21st St., New York, in which is discussed industrial dermatitis, along with descriptions of a protective manufactured by that company.

ENGINEERING DATA BOOK The International Machine Tool Corp., Foster Div., Elkhart, Ind., has completed an engineering data book covering the standard and special tools available for the Foster "Fastermatic" automatic turret lathes.

FILE BANDS Precision file bands manufactured by the Doall Co., Des Plaines, Ill., are described and priced in a folder available from that firm.

FUSE PULLER The Ideal Commutator Dresser Co., 1288 Park Ave., Sycamore, Ill., has prepared a mailing piece describing its line of "Safe-T-Grip" fuse pullers and fuse testing equipment.

GRINDING WHEELS Facts about the grinding wheels produced by Bay State Abrasive Products Co., Westboro, Mass., are presented in a bulletin prepared by that company. Included are tables setting forth tool and cutter and surfacing recommendations for various types of metal.

ELECTRONIC HEATING An illustrated 8-page bulletin (GEA-4076) issued by the General Electric Co., Schenectady, N. Y., describes the electronic method of heating metals, emphasizes its simplicity, and gives in detail the specifications of both the 5 kw. and the 15 kw., 550 kilocycle electronic heaters.

PAINT SPRAYING A wall chart of paint spraying rules showing how to save paint, air, time, power, fuel, and equipment, reduce lost time because of sickness or accident, and improve results, has been published by the Eclipse Air Brush Co., 400 Park Ave., Newark 7, N. J.

PERSONNEL RECORDS An eight page broadside illustrating four basic personnel records designed by Visible Index Corp., 535 Fifth Ave., New York, N. Y., is available from that company.

PHOTOSTATING Hunter Electro-Copyist, Inc., Syracuse, N. Y., has prepared a book describing in detail its equipment for producing "fast, photo-exact, error-proof reproduction," and illustrating various installations.

RIVETING All essential information on Cherry blind riveting operations is contained in a wall chart published by the Cherry Rivet Co., 231 Winston St., Los Angeles 13, Calif.

SAFETY The newly revised code for the use, care and protection of abrasive wheels (B7-1943) may be obtained from the American Standards Assn., 29 West 39 St., New York 18, N. Y. 35 cents.

SAWS, CONTOUR Contour saws in metal dispensing containers are described and priced in a catalog insert published by the Doall Co., 1201 Thacker St., Des Plaines, Ill.

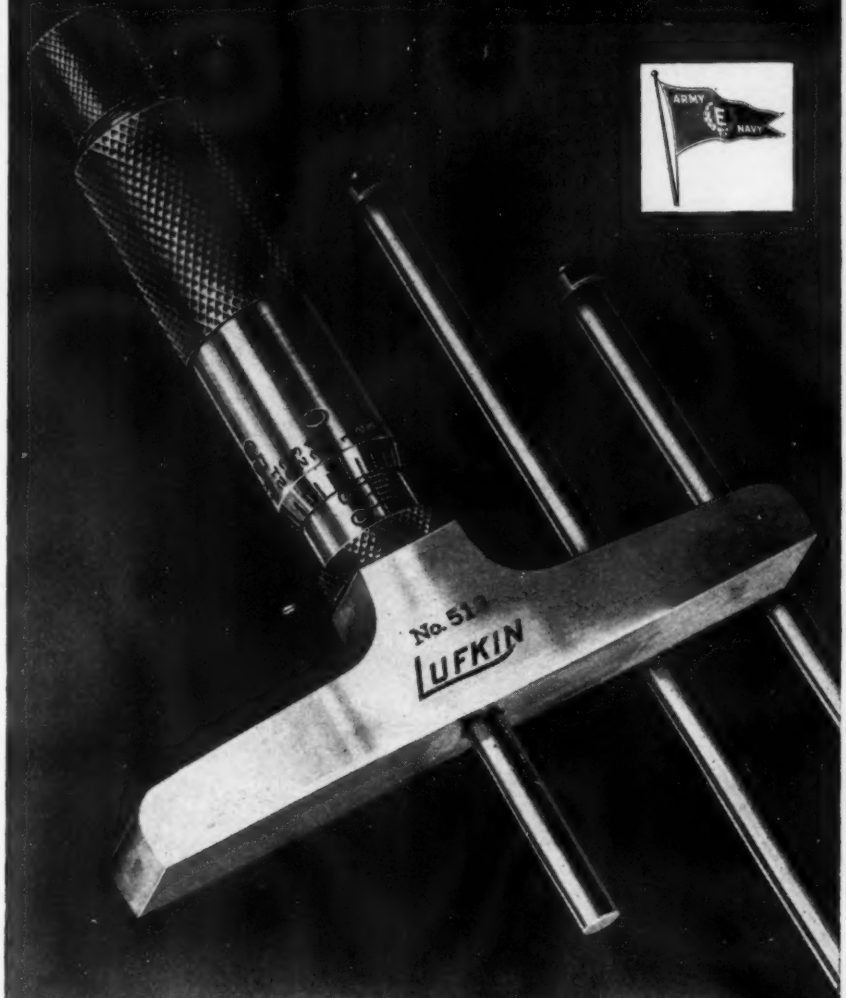
SAW LUBRICANT "Doall Saw Eez," "for smoother contour cutting and longer saw life," is described in a pamphlet issued by The Doall Co., Des Plaines, Ill. The lubricant is said to be good also on lathe centers, hack saws and other bearing surfaces.

SPEED CALCULATOR A calculator for quick determination of surface feet per minute for turning and threading different materials is offered by The Eastern Machine Screw Corp., Truman & Barclay Sts., New Haven 6, Conn. 15 cents.

STEEL, HIGH SPEED "Mustang" high speed steel applications are described, and typical analysis and graph

LUFKIN

MICROMETER DEPTH GAGE



QUICK, EASY, ACCURATE READING

Whenever you need to check the depth of holes or slots you can't beat a Lufkin Micrometer Depth Gage for all-around convenience and accuracy.

Each gage is provided with three rods (5/32" diameter) which permit measurements from zero to three inches by thousandths. Additional rods are available for measuring up to 6 inches. Adjustable nut to compensate for wear. Patented lock nut locks the rod at any desired point, maintaining reading and often preventing errors. Available with 3" or 5" base, knurled surface on top affording the firm hold essential for accurate measurements. See your dealer and write for complete Lufkin catalog.

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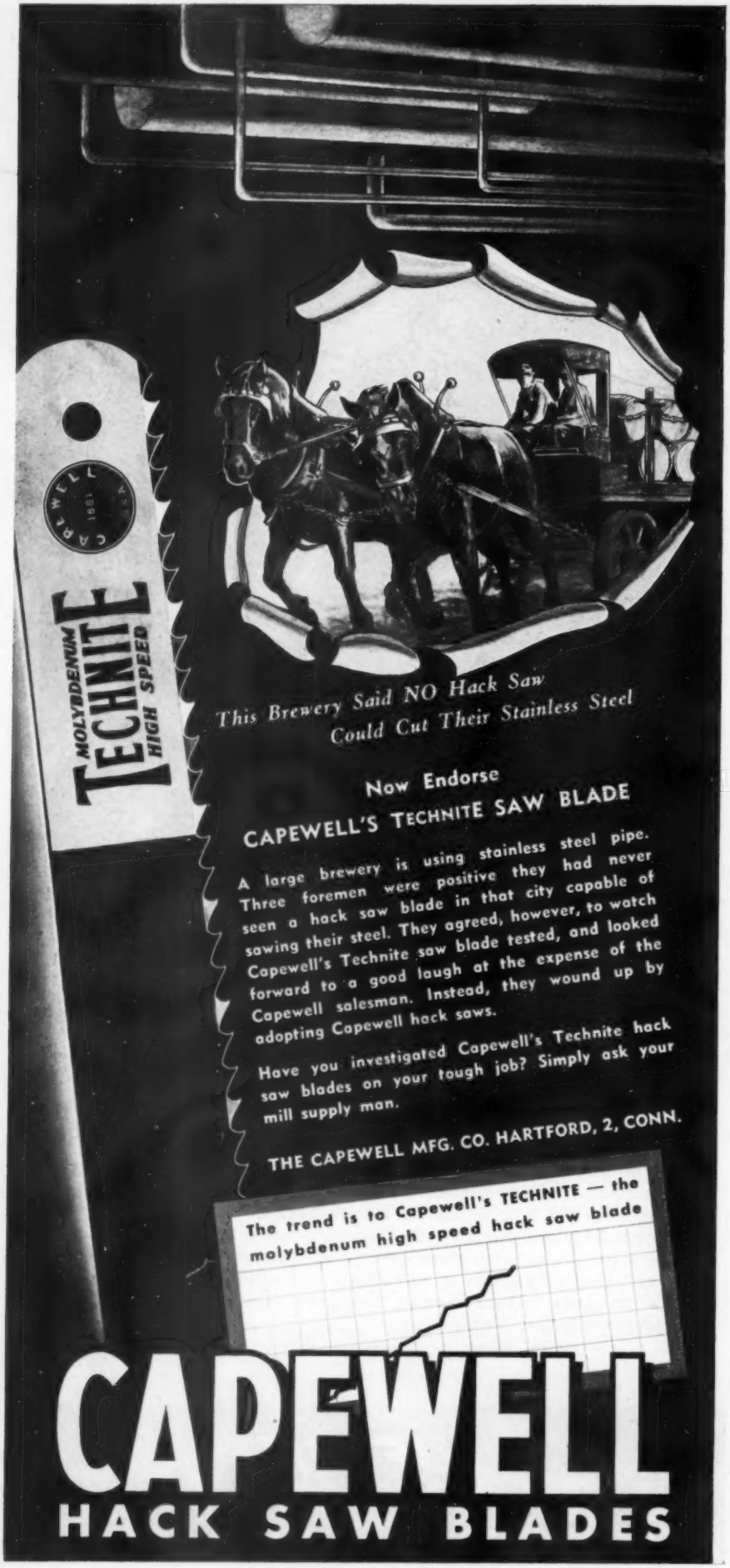
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TECHNITE
HIGH SPEED
CAPEWELL
1881
This Brewery Said NO Hack Saw
Could Cut Their Stainless Steel
Now Endorse
CAPEWELL'S TECHNITE SAW BLADE
A large brewery is using stainless steel pipe. Three foremen were positive they had never seen a hack saw blade in that city capable of sawing their steel. They agreed, however, to watch Capewell's Technite saw blade tested, and looked forward to a good laugh at the expense of the Capewell salesman. Instead, they wound up by adopting Capewell hack saws.
Have you investigated Capewell's Technite hack saw blades on your tough job? Simply ask your mill supply man.
THE CAPEWELL MFG. CO. HARTFORD, 2, CONN.
The trend is to Capewell's TECHNITE — the molybdenum high speed hack saw blade
CAPEWELL
HACK SAW BLADES

for hardening and drawing temperature given, in a booklet available from Jessop Steel Co., Washington, Pa.

VISE An envelope stuffer published by Master Tool Co., Boston, Mass., describes that firm's multi-swivel vise and gives illustrations of various applications.

X-RAY Picker X-Ray Corp., 300 Fourth Ave., New York, N. Y. has issued a 24-page booklet describing industrial applications of 150 kv x-ray units.

NEW BOOKS

HEAT-TREATMENT OF METALS — *By J. Winning. 99 pages. Published by Chemical Publishing Co., 234 King St., Brooklyn, N. Y.* $1.50.

This is a British text designed to give a condensed acount of modern heat-treating methods along with underlying principles on which they are founded. The author's intention was to provide a grasp of essential theoretical points and practical applications so that engineers and newcomers to industry obtain a grasp of the subject for use in everyday work, even though they are not metallurgists.

•

MECHANICS' MATHEMATICS — *By C. E. Greenawalt. Pocket size, 156 pages. Published by McKnight and McKnight, 111 West Market St., Bloomington, Ill.* $1.

This volume contains a combination of elementary arithmetic, with other mathematical data of particular interest to the mechanic. It furnishes a review of fractions, decimals, square root and other arithmetical operations. In addition it has tables of cutting speeds and feeds, gear proportions, milling machine formulas, strength of materials, screw threads and tapers.

•

A STUDY IN ARC WELDING—1289 *pages. Published by the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio.* $1.50 *in U. S. A.;* $2 *elsewhere.*

Applictions of the arc welding process are set forth in detail in this volume which consists of 98 award papers selected from the second $200,000 Industrial Progress Award program of the James F. Lincoln Arc Welding Foundation. These papers, in most cases, are reproduced in full, but a few of the more lengthy ones appear as comprehensive briefs. Together they reflect the practical experience of 113 men with the arc welding process.

Each of the nine sections into which the volume is divided represents a

distinct field of application. They include automotive, aircraft, railroad, watercraft, structural, furniture and fixtures, commercial welding, containers and machinery.

The book is edited by A. F. Davis and Ed C. Powers of the James F. Lincoln Arc Welding Foundation.

•

BLUEPRINT READING—*By D. E. Hobart, associate professor of mechanism and engineering drawing, University of Michigan. 90 pages. Published by Harper & Brothers, 49 East 33 St., New York, N. Y.* $1.

Machines and machine parts must necessarily be represented by drawings in orthographic projection, commonly called engineering drawings, and are not readily understandable to a person untrained in their interpretation. Many books have been presented as an aid in training people to read these drawings, and this book is an excellent addition to that list. It contains none of the theory of orthographic projection, but rather shows by illustration the results of representing an object by this method, and it points out the relationship of the various views to one another.

The book is replete with illustrations of objects chosen to represent parts common to industrial uses. These objects are first shown in perspective and the engineering drawings are then developed from them. In addition to reading the blueprint for obtaining numerical values of dimensions, a study of this book helps the reader to form a mental picture of the object represented. To aid in this, the author has included a chapter especially devoted to that subject, as well as over 40 blueprints intended to be used as problems by the reader.

SEEN and HEARD

By JOHN R. GODFREY

Reduce Cutter Breakage

In studying causes of milling cutter breakage, where the cutter cracks from periphery to the center, a tool engineer in a large Eastern plant came to the conclusion that a change in design of cutter keyways would reduce such breakage materially.

Most cutters are now manufactured with keyways having little or no radii at internal corners. Because of this, stresses and strains are concentrated close to the intersecting point in each corner, reducing the cutters' resistance to cracking under impact. In examining broken cutters it was found that the line of break, in many cases, led directly to a corner of the keyway.

As a solution, this engineer suggests that a large radius be cut in each

CHICAGO GRINDING WHEELS

In thousands of war plants, you'll find these tough, long-lived wheels on production lines grinding, burring, smoothing and finishing edges and surfaces on all kinds of products, parts, fixtures and tools, regardless of shape or material.

Custom build for your special work in any grain, grade or size, to meet today's exacting, get-the-job-done demands.

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● Some users may still be skeptical, but we assure you again that we make quick shipments. You see, with WPB approval, we now specialize* on Grinding Wheels and Mounted Wheels and Points up to 3" in diameter only. All larger sizes are out for the duration. Then too, our central location brings most customers within one day's shipping distance.

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MONEY BY THE BUCKETFUL

If inflation is not controlled, it may cost a bucketful of dollars to take the old familiar nickel streetcar ride.

High wages are not the cause of inflation. They help bring prosperity.

Inflation is caused by high costs and unjustified prices to consumers.

As long as Management does not worry about costs, both direct and indirect, we will have inflation.

As long as labor performs an easy day's work instead of a good day's work, high wages which should not cause inflation will contribute to it through excessive costs.

As long as business . . . the kind which we contact when we go to market . . . continues to charge "all the traffic will bear" we are reducing the purchasing power of the dollar and heading for inflation.

Our high standards of living are based upon high wages, low costs and low selling prices. As inflation goes up, our standards of living go down. And usually employment also falls off. Low prices and high wages create jobs.

HERE'S THE SOLUTION . . .
***Management* . . . CUT COSTS!**
***Labor* . . . PERFORM!**
***Business* . . . KEEP PRICES DOWN!**
***Everybody* . . . RENDER GOOD SERVICE!**

Geo. D. Trundle Jr.
President

THE TRUNDLE ENGINEERING COMPANY

Consulting Management Engineering

GENERAL OFFICES · CLEVELAND · BULKLEY BLDG.
CHICAGO · City National Bank Bldg. · 208 S. La Salle Street
NEW YORK · Graybar Building · 420 Lexington Avenue

corner, extending, possibly 1/16 to ⅛ in. into the cutter hub from the point of intersection of the side and bottom of the keyway. By doing this, it is believed the strain would be spread over a greater area, with a consequent reduction in cracked cutters resulting from normal operations.

Views on Postwar Machine Tool Exports

By a Prewar European Distributor

There are several problems to be faced in the postwar machine tool export business, inasmuch as the United States Government will have on hand large numbers of machine tools when the war comes to an end. It remains to be seen how these machines will be disposed of.

If the government sells these machines to Allied governments without regard to the foreign arrangements of American manufacturers, it may have a most serious effect on the future exports of machine tools from this country.

In the past, the outstanding American manufacturers . . . were represented in Europe by firms which had complete technical staffs to promote sales and demonstrate machines after their arrival. This service would be completely disrupted if foreign agents were to be dispensed with.

I understand that a number of American machine tool manufacturers desire to create a joint organization to deal directly with European buyers by maintaining offices and showrooms in several important European centers. Such branches would be manned by American experts. I desire to remind the manufacturers that such a venture was made after World War I. It was a complete failure. The American experts have as little experience with European markets and distribution as British, French or German experts have with distribution in the United States. It requires a lifetime to become acquainted with the intricacies of merchandising in Europe, which is different from one country to another. The languages, the customs, mentality and even business ethics are so different it would require a separate staff for each country to take care of the various ways of doing business. While a central organization might cover expenses for the first couple of years after the war, it could not possibly hold its own without serious loss for a longer period. Machine tool business in Europe is erratic—two or three good years will be followed by five, seven and even ten poor years.

A European distributor for American machines takes good care that during these lean years he has something else to sell such as small tools, pumps, lifting gear and other items of various description. These are not

HOW TO ORDER SHEFFIELD THREAD ROLL-SNAP GAGES

In ordering Thread ROLL-SNAP Gages be sure to state: 1. Style • 2. Major or outside diameter • 3. Pitch or threads per inch • 4. Pitch diameter of the GO and NOT GO rolls • 5. Complete marking instructions.

Sheffield Thread ROLL-SNAP will be set and sealed before shipment when Setting Plugs are included in the order. Otherwise, Thread ROLL-SNAP Gages will not be set at the factory unless the customer furnishes proper setting gages, except in the cases of standard specifications from No. 4 to 1½", NF-2, NF-3, NC-2 and NC-3. • In all cases, however, the limits will be stamped on the gage marking ring.

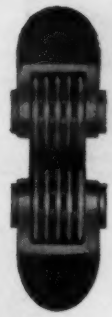
Write for descriptive bulletin No. G662-143

THE SHEFFIELD CORPORATION

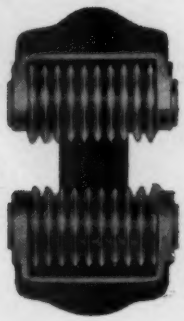
SHEFFIELD MASTER CRAFTSMEN

Dayton 1, Ohio, U.S.A.

Style A for ¼" and larger, for pitches 9 to 32 inclusive and has a GO roll of .350" in length.

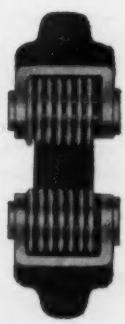


Style B for ¼" and larger, for pitches 6 to 28 inclusive and has a GO roll of .980" in length.



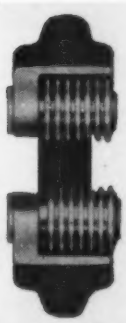
Style C for No. 12 and smaller, for pitches 24 to 56 inclusive and has a GO roll of .250" in length.

Style D for ¼" and larger, for pitches 6 to 32 inclusive and has a GO roll of .625" in length.



Style F for ¼" and larger, for pitches 6 to 32 inclusive except 5, 10, 13, and 16 has a GO roll of .675" in length.

Style F for ¼" and larger, for pitches 5, 10, 13, and 16 only has a GO roll of .725" in length.



Style E for ¼" and larger, for pitches 7 to 32 inclusive and has a GO roll of .475" in length.

Manufactured Under Patents Nos. 1,660,335; 1,851,283; 1,930,558

W-S Standard Lathe Centers with carbide tips. Morse, Brown & Sharpe and Jarno tapers for both TURNING and GRINDING.

STANDARD
CEMENTED CARBIDE TIPPED
CENTERS

SAVE ON SET-UP, ADJUSTING and GRINDING TIME with these more *accurate* W-S Lathe Centers. Their concentricity is *guaranteed* to within .0002" or less! Made by entirely different method of manufacturing, W-S Centers help assure the highest degree of precision work from your machine tools. Genuine CARBOLOY tips (other carbides may be specified) reduce friction and give a cooler, more perfect bearing. The craftsmanship inherent with all W-S Centers goes far beyond the point of visual inspection. However, it is evidenced in their ability to maintain greater accuracy while outlasting from 10 to 60 ordinary centers. Carbide tipped tools are not just a specialty with us . . . we make them *exclusively*. The majority of sizes is available from stock most of the time. Write for FREE Catalog 942-A and latest prices. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI.

W-S Carbide Tipped Core Drills available in straight and tapered shanks. Sizes: 1/2 to 1-1/2.

W-S Standard Reamers with Carbide Tips. Tapered and straight shanks. Sizes: 1/4 to 1-1/2.

WENDT SONIS

CARBOLOY CUTTING TOOLS

CENTERS ★ DRILLS ★ CORE DRILLS ★ COUNTERBORES ★ SPOT FACERS
END MILLS ★ REAMERS ★ HOLLOW MILLS ★ LATHE BITS ★ SPECIAL TOOLS

necessarily of American manufacture as they might not suit the European market or might be prohibitive in price. He fills the gaps by using his initiative. I remember one American manufacturer who started branch offices in Europe and was unable to import certain staple articles and had to manufacture some in Europe and buy many others. The distributor knows how he can fill the gaps, an impossible task for a delegate of American machine tool manufasturers.

As said before, this plan has been tried in the past and has not succeeded. It resulted in a big loss for the American partners.

There is another important question. What will become of the German machine tool industry after the war? To start any rearmament program requires machine tools, consequently, there should be an extremely severe control over German machine tool manufacturers to prevent them from building any machines for which the object was not thoroughly known.

Furthermore, undue competition might be avoided. You know, of course, that in the years before the war, substantial orders for machine tools could be placed in Germany at reduced prices. Each and every transaction was completed only after a lot of bargaining.

It should be considered whether a total supression of the German machine tool industry would be necessary. It is common knowledge that, notwithstanding the control of Allied powers, after World War I the manufacture of armaments was continued by Germany. No confidence or faith can be placed for a second time with the German people. It may, therefore, be prudent to do away with the original means which might induce the Germans to rearm again. Good use might be made by other countries of their skilled labor and competent engineers.

I suppose that after the war a number of machine tools will be required on account of the destruction that will have taken place in Europe. One kind of machine will be needed immediately; namely, machines for rolling stock such as wheels lathes, axle lathes and quartering machines. I understand that the manufacture of these machines has been somewhat neglected in the last few years and it is important that such machines should be reconsidered. Some of the German manufacturers have improved machines for railroad stock in a most effective manner and the production of these machines was considerably higher than similar machines made in the United States. Another handicap to these heavy machines made here was the transportation cost, as the relative freight on very heavy parts increased the price considerably.

The matter of export machine tools should have the early attention of the American manufacturer.

Meehanite Foundries

Allentown, Pa.
Traylor Engineering Company

Ansonia, Conn.
Farrel-Birmingham Co., Inc.

Birmingham, Ala.
Continental Gin Company

Bridgewater, Mass.
The Henry Perkins Co.

Brooklyn, New York
E. W. Bliss Company

Buffalo, N. Y.
Pohlman Foundry Co., Inc.

Charleston, W. Va.
Kanawha Manufacturing Co.

Chattanooga, Tenn.
Ross-Meehan Foundries

Chicago, Ill.
Greenlee Foundry Company

Cincinnati, Ohio
Cincinnati Grinders Incorporated
The Cincinnati Milling Machine Co.

Cleveland, Ohio
Fulton Foundry & Machine Co.

Denver, Colo.
The Stearns-Roger Mfg. Co.

Detroit, Mich.
Atlas Foundry Co.

Flint, Mich.
General Foundry & Mfg. Company

Hamilton, Ohio
The Hamilton Foundry & Machine Co.

Hamilton, Ontario, Canada
Otis-Fensom Elevator Company

Irvington, N. J.
Barnett Foundry & Machine Co.

Jeannette, Pa.
Elliott Company

Los Angeles, Calif.
Kinney Iron Works

Milwaukee, Wis.
Koehring Company

Mt. Vernon, O., Grove City, Pa.
Cooper-Bessemer Corporation

New Rochelle, N. Y.
Meehanite Metal Corporation

New York, N. Y.
The American Brake Shoe Co.

Oakland, Calif.
Vulcan Foundry Company

Orillia, Canada
E. Long, Ltd.

Philadelphia, Pa.
H. W. Butterworth & Sons Co.
Florence Pipe Foundry & Machine Co., (R. D. Wood Company, Selling Agents)

Phillipsburg, N. J.
Warren Foundry & Pipe Corp.

Pittsburgh, Pa.
Rosedale Foundry & Machine Co.

Portland, Oregon
Crawford & Doherty Foundry Co.

Rochester, N. Y.
American Laundry Machinery Co.

St. Louis, Mo.
Banner Iron Works

St. Paul, Minn.
Valley Iron Works

Seattle, Washington
Washington Iron Works

London, Eng.
The International Meehanite Metal Co., Ltd.

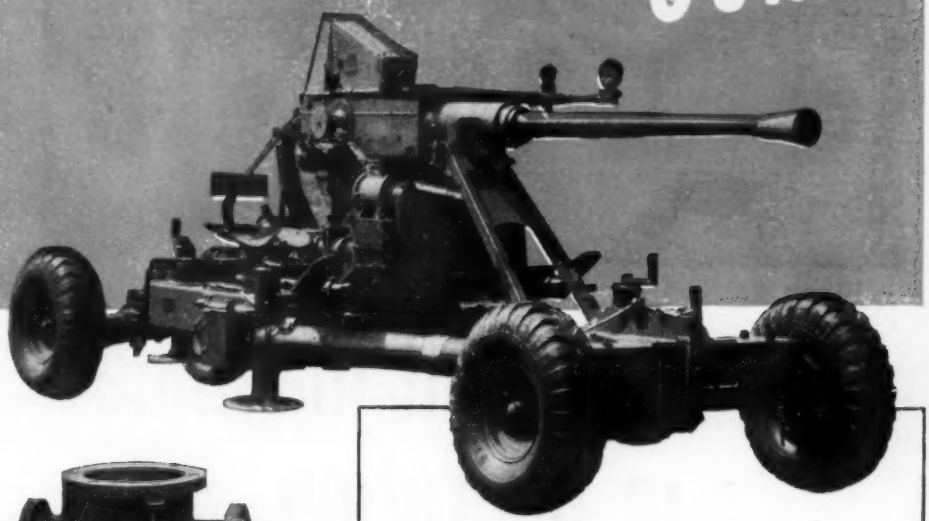
Waterloo, N. S. W.
Australian Meehanite Metal Co., Ltd.

Johannesburg, South Africa
Meehanite Metal Co. (S.A.) (Pty.) Ltd.

Meehanite—

replaces scarce metals in—

BOFORS ANTI-AIRCRAFT GUN

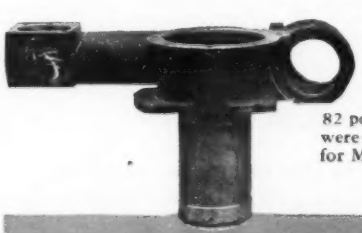


To conserve strategic metals, Meehanite Castings have replaced manganese and tin bronze in some 20 parts of the Bofors Anti-Aircraft Gun without reducing the effectiveness of the gun in any way. The economy, reliability and versatility of Meehanite, find many wartime jobs for this material.

Write for details today.

This 28-pound Gear Case, formerly made of manganese bronze, is now produced in Meehanite.

Top Gear Box, containing gears for training mechanism, was also made of manganese bronze. High strength (55,000 p.s.i.) Meehanite now used.



82 pounds of much-needed tin bronze were saved, per gun, by using Meehanite for Main Body Elevating Gear Boxes.

MEEHANITE RESEARCH INSTITUTE

New Rochelle, New York

See an Ozalid machine in operation

The chances are—Ozalid whiteprints are being made in a plant in your vicinity ...and you may be able to witness a demonstration of simplified printmaking.

Bring your own engineering drawings. *See* how you can make whiteprints in one continuous operation ... and save time, labor, and materials.

COMPARE OZALID WITH ANY OTHER METHOD

You'll be surprised at the compactness of an Ozalid machine.

It can be installed in any corner of the drafting room. This saving in floor space is possible because Ozalid eliminates the chemical baths, driers, and plumbing connections employed in other processes.

This simplification allows you to quickly train an inexperienced person to operate the machine at top efficiency.

In addition, you get exclusive printmaking extras! ...

CHECK THESE OZALID EXTRAS

1. You're able to use the widest variety of sensitized materials—papers, cloths, and foils ... and make prints having blue, black, or maroon lines on a white background.

You'll find that Ozalid whiteprints are easier to read and check than blueprints. They are also fade-proof and wash-fast.

2. You make "duplicate originals" in the same manner as standard prints —no Van Dyke difficulties. These may be used in place of the original in subsequent print production...or to eliminate unnecessary drafting when making design changes.

It is not necessary to redraw any part which remains the same as in the original!

3. You're able to use cut sheets as well as roll stock in an Ozalid machine, thereby eliminating trimming waste.

No paper is lost by pasting up "leaders."

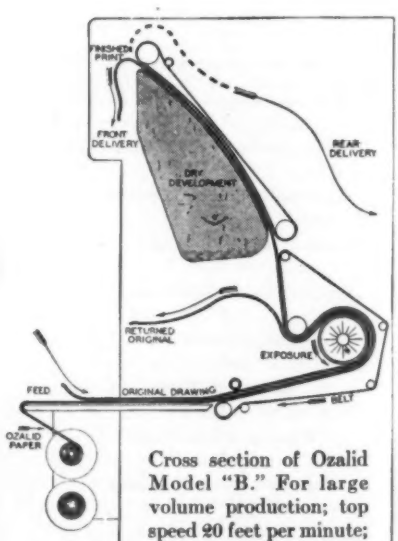
No prints are unusable because of distortion.

FULL LINE OF MACHINES

There's an Ozalid machine for every print production requirement. So if you want to turn out prints at speeds up to 20 feet per minute—or if you need only a dry developing unit to use with your present printer—adopt Ozalid.

Write for catalog and sample booklet of whiteprints. See how leading manufacturers, save time, labor, and materials.

OZALID—MORE THAN A PRINTMAKING PROCESS



Cross section of Ozalid Model "B." For large volume production; top speed 20 feet per minute; front or rear print delivery; many new features.

OZALID PRODUCTS DIVISION

GENERAL ANILINE AND FILM CORPORATION

Johnson City, N. Y.

OZALID IN CANADA—HUGHES OWENS CO., LTD., MONTREAL

Facilities and Craftsmanship—Yours to Command

Dow supplies sand castings of Dowmetal Magnesium Alloys that meet the strictest Government specifications. These parts are fabricated in our own shops under strict metallurgical control and are an important feature of Dow's overall magnesium service, which ranges from ingots to finished products.

Dow is cooperating with producers of wartime products that call for magnesium parts. If your developments for peacetime markets include the use of magnesium, we suggest consultations with us. The advantages of our long experience with this weight-saving metal are yours to command.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • Cleveland • Chicago • St. Louis • Houston • San Francisco
Los Angeles • Seattle

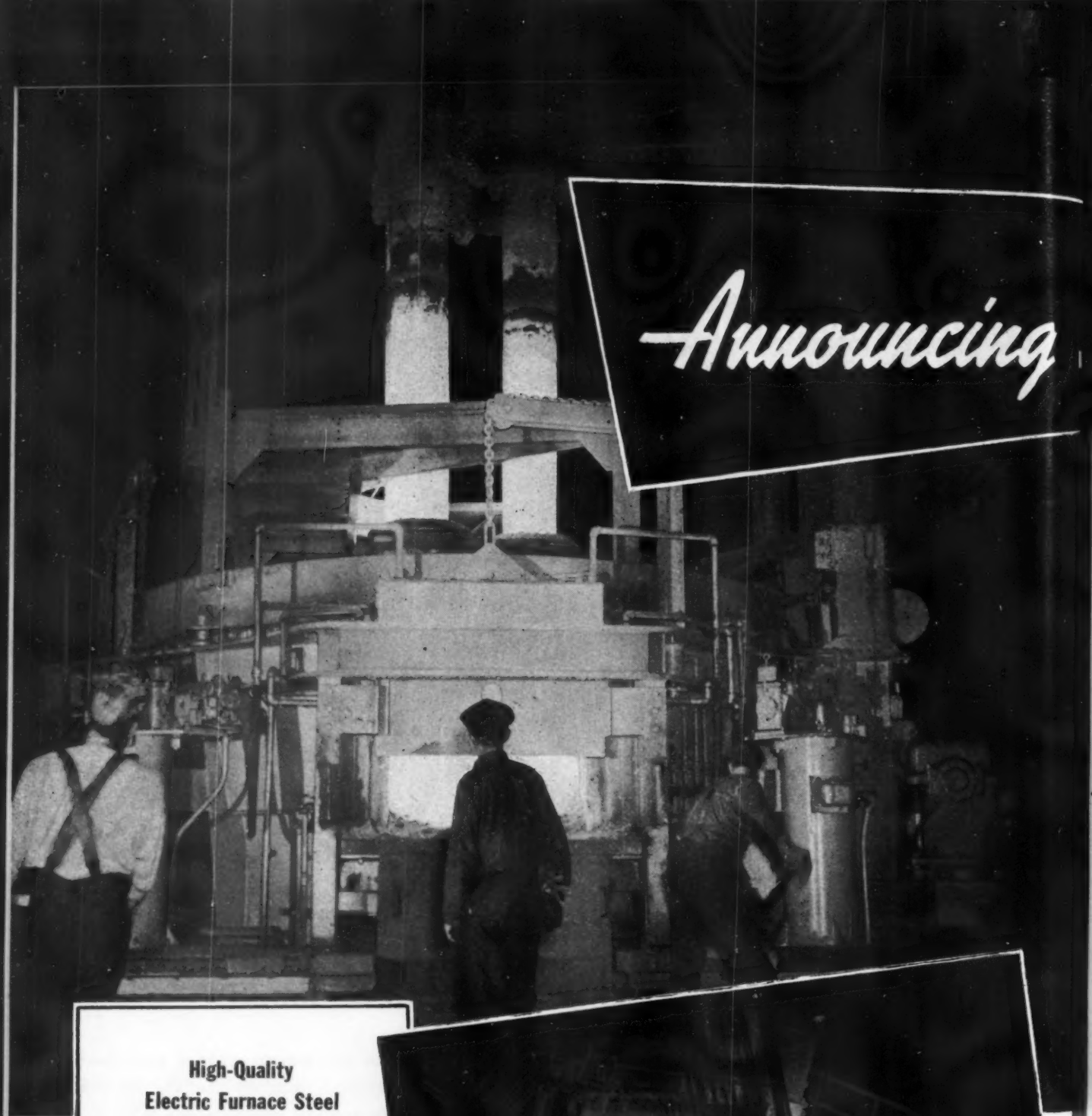
MAGNESIUM

PRODUCER SINCE 1916

DOWMETAL

FROM INGOTS TO FINISHED PRODUCTS

INGOTS • CASTINGS • FORGINGS • SHEET • STRIP • PLATE • EXTRUSIONS



Announcing

High-Quality Electric Furnace Steel starts here

One of the new Heroult electric furnaces now making alloy steel at our Duquesne Works. All welded construction—equipped with 20-inch graphite electrode—the platform attached to the shell tilts with the furnace when pouring. Novel features that make for improved performance include ball and roller bearings on electrode arms and winches; water-cooled, current-carrying copper tubing arranged to prevent hysteresis and eddy current losses; improved wedge-type electrode holders.

ONE AIM . . . VICTORY . . . BUY BONDS!

New, greatly increased Electric Furnace capacity to serve the East with quality alloy steels

IMPORTANT to every user of alloy steel in the Eastern area is the recent expansion of our electric furnace capacity at Duquesne, near Pittsburgh.

Now in operation, this large and thoroughly modern plant brings to your very door-step, facilities for rolling, annealing and heat-treating a complete range of fine electric furnace steels in all commercial forms.

Equipment throughout, from raw materials handling to finish processing, embodies the most advanced ideas in electric steel production.

High-efficiency Heroult electric furnaces of the very latest type assure top metallurgical performance. With capacities ranging from 7 to 70 tons each, they provide a wide degree of flexibility to handle both large and small orders.

Soaking pits are provided with automatic combustion control to insure greater uniformity in heating the steel. A seven-chamber continuous annealing and heat-treating furnace, automatically controlled, insures superior physical properties in the heat-treated product. It is supplemented by batch type furnaces for handling larger bar sizes and special heat-treating requirements.

The auxiliary equipment is of the latest, most improved design and is adequate to meet the many and various needs of the alloy steel user.

Equipment facilities are matched in calibre by the skill of experienced mill and metallurgical personnel whose constant watchword is "Quality First."

Now ready to expedite the servicing of your wartime needs for electric steels, this new plant will, in the future, be ready to serve your peacetime requirements—both in small and large tonnages—with the same high quality for which U·S·S Carilloy Steels are noted.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* • United States Steel Export Company, New York

USS

UNITED STATES STEEL

NEED ANY HELP...

On GOVERNMENT SPECIFICATIONS for STAINLESS STEEL?

GOVERNMENT Specifications are complex . . . every word has meaning. Condensing them into simplified form or commercial grade designations involves the risk of omitting important descriptive detail.

You may be familiar with A. I. S. I. type numbers, and believe certain "specs" cover the same analysis as the type number. Yet there are other details to consider . . . special physical properties, tolerances as well as special testing requirements.

Very often "specs" permit latitude in your selection of analysis, physicals, tolerance and almost always — finish. Making use of allowable options for a specific use may greatly ease your problems of procurement or fabrication and here RUSTLESS can help you.

We produce nothing but Stainless Steels and through our daily familiarity with their specifications, we are in position to help. Write or wire the nearest Rustless Office for advice.

Rustless *Producing* STAINLESS STEEL *Exclusively*

WHEN YOU WANT TO KNOW ABOUT STAINLESS...

Ask

RUSTLESS

Iron and Steel Corporation

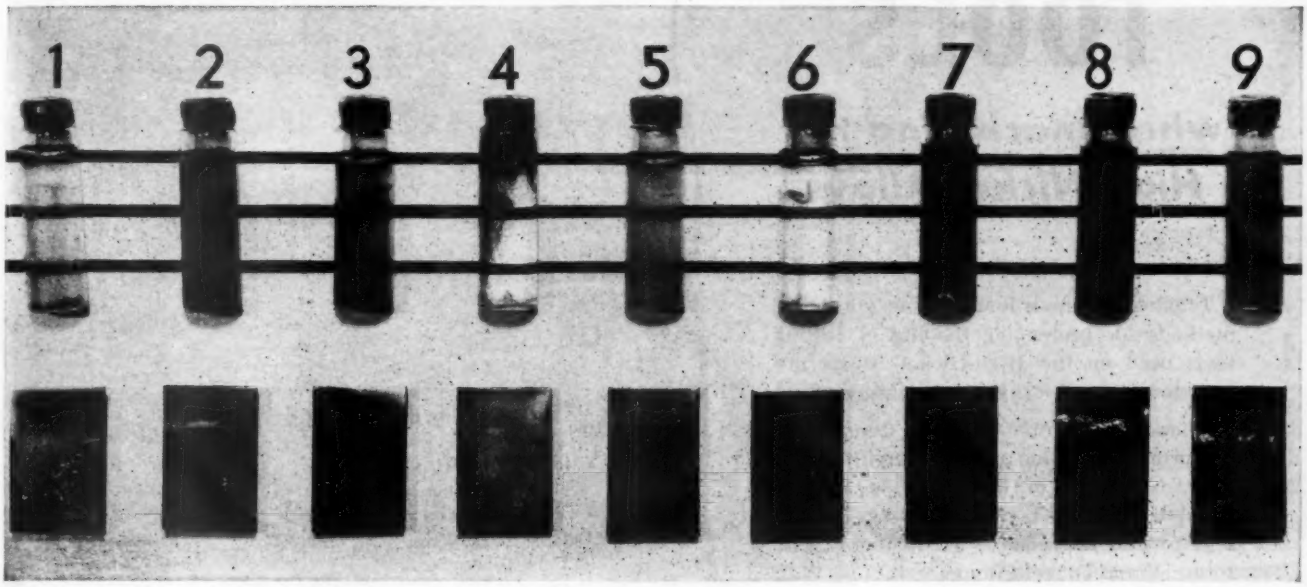
Baltimore, Maryland

CORROSION AND HEAT-RESISTING STAINLESS STEEL

SALES OFFICES: BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES • NEW YORK • PHILADELPHIA • DISTRIBUTORS IN PRINCIPAL CITIES

TEST RESULTS

ANTI-CORRODE vs. Competitive Products



From an unretouched photograph.

To substantiate our convictions that Anti-Corrode is an unexcelled rust-preventive, nine steel strips were cut from a sheet of No. 18 B. & S. deep drawing steel which had been thoroughly cleaned mechanically. One strip, number 6, was dipped in Cities Service Anti-Corrode. Seven others were treated with leading anti-rust compounds according to their manufacturers' directions. One strip, number 8, used as the control, was not treated.

All strips were then partly immersed in small bottles of distilled water containing 3% Sodium Chloride. At the end of 90 hours they appeared as displayed above. Each test strip is shown before its bottle of solution. The rust penetration on each strip is plainly evident. The background lines behind the bottles enable comparison of rust density found in the solutions after test. The superiority of Anti-Corrode—number 6—is obvious.

OUTSTANDING QUALITIES OF ANTI-CORRODE

Anti-Corrode is harmless to metal. It can be applied by brushing, spraying or dipping, and is a reliable safeguard against corrosion of metals in any form or state of finish, whether in storage or in transit. Anti-Corrode forms a tenacious, durable film that is impervious to moisture and the more common gases present in the atmosphere. Since it contains lubricating material, it need not be removed in drawing operations. It can be removed easily with kerosene or any petroleum solvent.

USERS' COMMENTS ON ANTI-CORRODE

"Our castings that have been properly dipped in Anti-Corrode show no signs of rusting after a month's exposure to rain and snow."

Assistant Plant Supt.
Large manufacturer of filters.

"We are pleased with the test results of Anti-Corrode on our rust problems and will place a substantial order with you shortly."

Manufacturer of special tools and accessories.

"$8,000 worth of dies were recently ruined by rust. This costly waste of vital materials is now being prevented with Anti-Corrode."

Manufacturer of ballistic dies.

"Condensation of moisture in storage vaults had been rusting our highly-precisioned tools and dies. Anti-Corrode has licked this problem."

Manufacturer of precision instruments.

Take advantage of the FREE demonstration offer. Send the coupon NOW! (Available only in the Cities Service marketing territory EAST of the Rockies.)

CITIES SERVICE OIL COMPANY
Room 1746
Sixty Wall Tower, New York 5, N. Y.

I'd like to test Anti-Corrode on my own equipment FREE OF CHARGE. Please send me the details.

Name_____
Company_____
Address_____
City_____ State_____

OIL IS AMMUNITION—USE IT WISELY!

CITIES SERVICE OIL COMPANY
NEW YORK · CHICAGO
IN THE SOUTH
ARKANSAS FUEL OIL COMPANY
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Tune in Friday Night "The Cities Service Concert"
8 P.M. EWT, NBC Network.

How to get the most out of

CUTTING TOOLS

when machining the High-Nickel Alloys

Tools are weapons . . . *treat 'em right!*

Practical methods for "treating 'em right," methods for prolonging the life of cutting tools used on the High-Nickel Alloys are included in the INCO Bulletin, "Machining."

The section devoted to Cutting Compounds is reproduced on this page. A complimentary copy, or copies, of the complete 16-page booklet, Bulletin T-12, Machining, will be sent to you on request. Write today. The International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y.

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TABLE III
Cutting Fluids

Operation	Cutting Lubricant*
Rough turning	Sulfurized, dry, or water soluble oil
Finish turning	Sulfurized, or water soluble oil
Rough planing	Water soluble, dry, or sulfurized oil
Finish planing	Water soluble, or sulfurized oil
Shaping	Water soluble, dry, or sulfurized oil
Milling	Sulfurized oil
Drilling under $\frac{1}{16}$ in.	Turpentine, or gasoline
Drilling $\frac{1}{16}$ in. to $\frac{1}{4}$ in.	Sulfurized oil (cut), or lard oil
Drilling over $\frac{1}{4}$ in.	Sulfurized, or water soluble oil
Threading	Sulfurized oil
Tapping	Sulfurized oil
Boring	Sulfurized oil
Reaming	Sulfurized oil
Broaching	Sulfurized oil
Cold sawing (Low-speed circular saw)	Sulfurized
Cold sawing (Hack saw, etc.)	Sulfurized, or water soluble oil
Grinding	Water soluble oil

* For the operations where there are two or more cutting lubricants suggested, the one mentioned first is considered preferable.

obtained by covering the metal with a heavy, sulfurized oil before each cut.

Sulfurized oil should always be used as a coolant for automatic screw machine work on the free-machining alloys "R" Monel and "KR" Monel.

Discoloration which may be produced by sulfurized oil can be removed readily by soaking the work from 20 to 30 minutes in a cold 10 per cent solution of sodium cyanide. Since this solution is poisonous, great care should be exercised in its use.

All lubricants should be removed completely from the machined pieces that are to be subjected to high temperatures, either during subsequent fabrication, or in service.

Following are some of the interesting results of tests by O. W. Boston and W. W. Gilbert[9] concerning the influence of cutting fluids in turning Monel.

A rich emulsion of one part of soluble oil to 15 parts of water materially increased the cutting speed values for any tool life over those of the lean mixtures composed of one part of soluble oil to 50 parts of water.

It appears that an emulsion is entirely satisfactory as a cutting fluid for turning Monel. The sulfurized mineral oil caused the chips to coil closer and break up more frequently.

The use of a rich emulsion of soluble oil permitted maximum increase of 22.7 per cent in the cutting speed over dry cutting speed.

All cutting force components are highest when cutting dry; they are intermediate when cutting with an emulsion of soluble oil; and are lowest when cutting with the sulfurized mineral oil.

Sulfur-bearing lubricants should not be used when machining the high-nickel alloys with cemented carbide tools.

Cutting Compounds

As previously mentioned, the cutting of the tough, high-nickel materials may develop high frictional heat, and, consequently, a proper cutting fluid is necessary for best results. By the correct use of a good cutting oil, the machining speed may be increased in the neighborhood of 25 per cent over a satisfactory speed for dry cutting. Not only may production be increased by the use of a good cutting fluid, but there will be noticeably increased time between tool grinds and greatly improved finish on the product. Suitable compounds for various classes of work on the high-nickel materials are given in Table III.

Some machining operations may be accomplished successfully without a cutting fluid, but only with a sacrifice of speed and finish. In order to get the best results, a continuous and abundant supply of cutting fluid should be fed to the tool. Cutting fluids are absolutely essential when the nature of the machining operation is such that there is no opportunity for heat to be dissipated rapidly by radiation into the surrounding air, as, for example, such operations as drilling, boring, tapping, and reaming.

Some machines may not be equipped for pumping oil to the tool, but even without a continuous flow of oil, a noticeable improvement, especially in finishing cuts, may be

Cutting-Off Operations

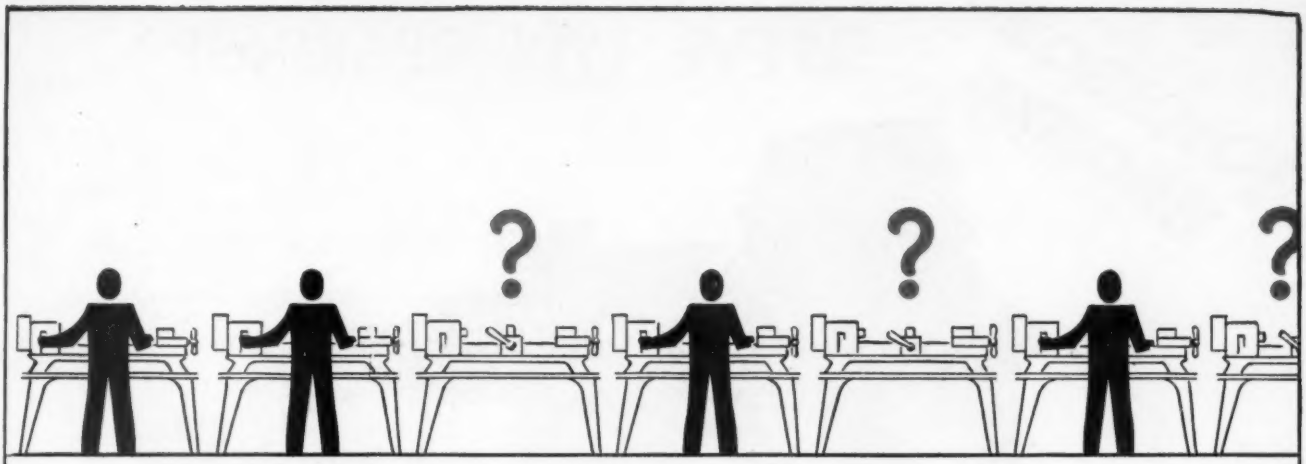
The power hacksaw is
for cutting such forms
to a desired len

[9] "A Study of Cutting Fluids Applied to the Turning of Mon
Boston and W. W. Gilbert, Ann Arbor, Michigan; Trans.
No. 8, November 1936, paper M.S.P.-58-10, p. 6

INCO NICKEL ALLOYS

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • "Z" NICKEL • NICKEL

Sheet . . . Strip . . . Rod . . . Tubing . . . Wire . . . Castings



Let's "air" some of your manpower problems

When manpower difficulties are analyzed, two factors generally appear as major problems: getting replacements with the necessary *strength* to handle heavy work and *training* green employees to the point where they can be trusted to handle expensive and complex equipment.

If you have problems like these, the chances are excellent that Westinghouse Remote Control Equipment can help you.

The small W·A·B control handle moves at a finger-touch, and produces a precise response from the operating mechanism. The *force* exerted by the operating mechanism can be exactly adjusted to the job—anything from an ounce to tons.

Control of a whole series of operations can be concentrated in one handle. It is impossible for an inexperienced operator to alter the cycle, and damage the machine. And interlocks can be easily provided to further compensate for any lack of skill or judgment.

W·A·B Remote Control Systems are already installed and successfully operating on production equipment, conveyors, cranes, hoists, shovels, and ships. But current uses have merely scratched the surface of their possibilities.

Somewhere in your plant, or in the products you manufacture, there is a place for W·A·B Remote Control Systems. It may be that "off the shelf" W·A·B devices can do the job. One of our representatives will be glad to talk things over with you. Write, wire or phone.

Westinghouse Air Brake Company

INDUSTRIAL DIVISION

General Offices: Wilmerding, Pa.

74 Years of Pneumatic Control Experience

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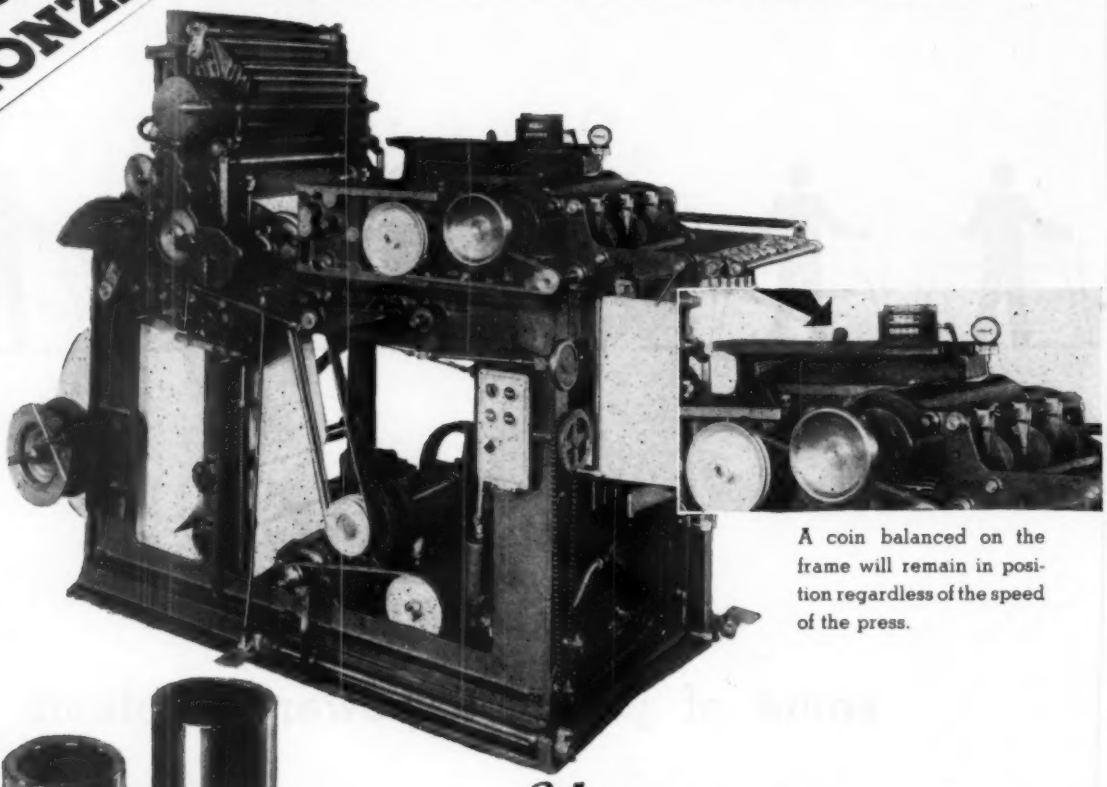
Pneumatic • Pneumatic-Electric • Pneumatic-Hydraulic

control systems

JOHNSON BRONZE SLEEVE TYPE BEARINGS



A coin balanced on the frame will remain in position regardless of the speed of the press.

Eliminate VIBRATION

THIS Offset Press, manufactured by the Pittsburgh Lithograph Press Company, provides an excellent example of how SLEEVE TYPE Bearings eliminate vibration. You can balance a coin on the frame of this press . . . start it operating from a dead stop . . . bring it up to a speed of 27,000 impressions per hour . . . shut it down to a dead stop—and the coin will remain undisturbed.

This is the type of performance manufacturers can expect when their SLEEVE BEARINGS are correct in design . . . properly installed. Helping manufacturers of *all* types of equipment select the correct bearing for each application has been a welcome assignment for Johnson Bronze for more than 35 years.

If you have a bearing problem . . . either for present production . . . or for postwar planning . . . consult with Johnson Bronze. A qualified Sales Engineer is as near as your phone. Why not call him in TODAY?

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are designed and built for ruggedness and unsurpassed holding power. Their application to literally thousands upon thousands of munitions and precise aircraft jobs has contributed — and still contributes — to Efficiency in the war production program.

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THE NATIONAL STANDARD *for War Production*

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MINIMUM DRAG ASSURES COOL RUNNING WITH THE

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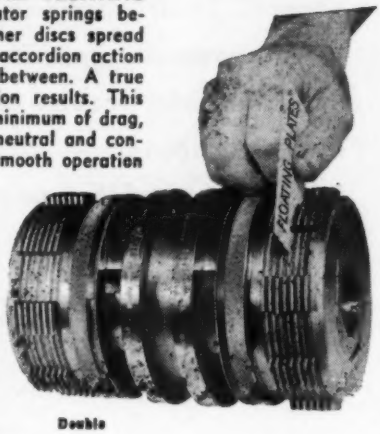

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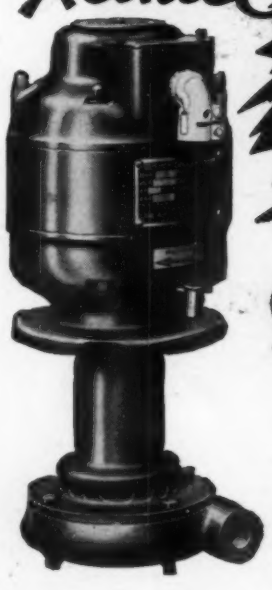

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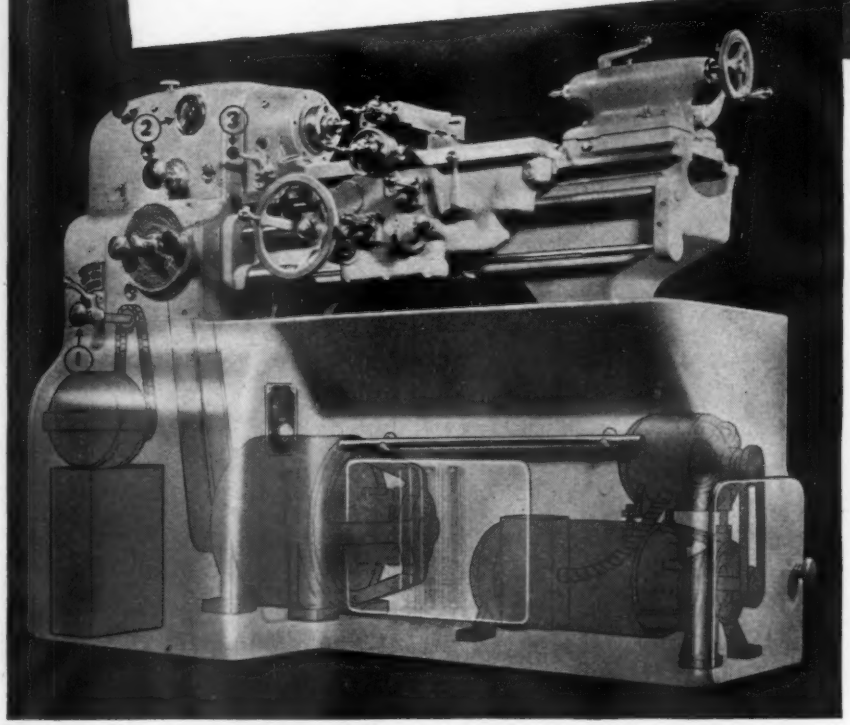

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A BUILT-IN ALL-ELECTRIC DRIVE FOR A-C CIRCUITS

eliminates gears, brakes and clutches

Precision Lathe with Built-In Reliance V★S Drive

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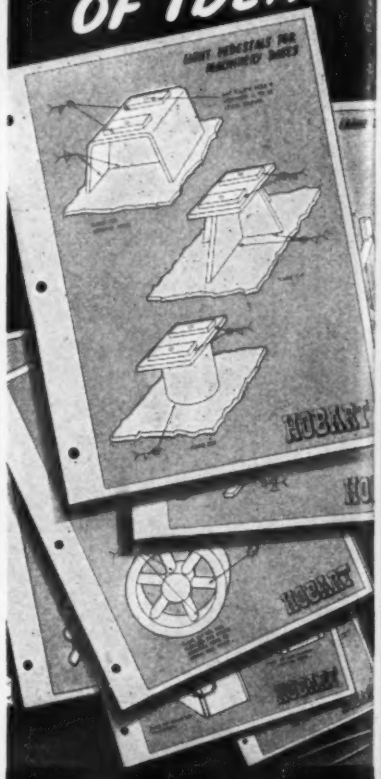

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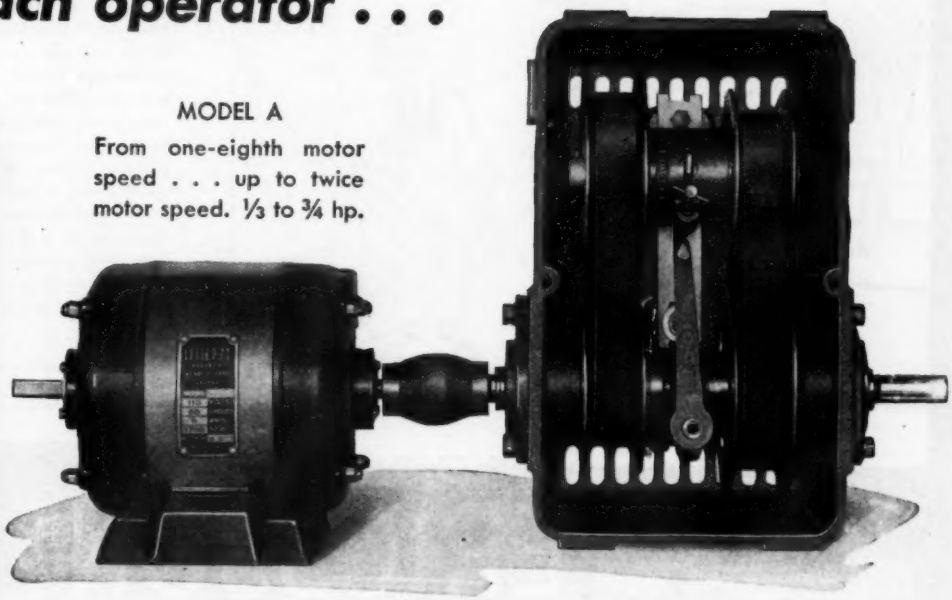

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✓ Single-unit construction . . . compact and strong

✓ 16 to 1 speed ratio . . . highest speed ratio in its price range

✓ Positive automatic belt tensioning . . . without springs

✓ Absolute assurance of smooth efficient operation

✓ Can be installed in any position . . . on any machine, new or old

✓ Can be used with any standard motor, 1725 to 1800 r. p. m.

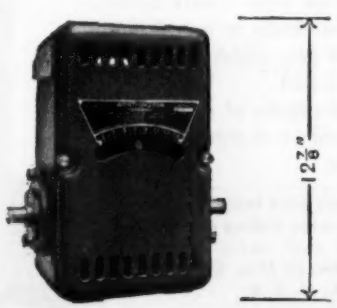
✓ Operates in either direction . . . direct-connected to motor or through V-belt or flat-belt drive

The WORTHINGTON ALLSPEED DRIVE

Reports from many plant engineers and time-study men show that their production has been stepped up 25% to 200% with this equipment. Another war-time value is the fact that it simplifies the training of machine operators . . . by permitting initial operation at low speeds, increasing the speed gradually as skill is acquired.

The advantages of such FINGER-TIP SPEED CONTROL are many and far-reaching. There are probably applications in *your* plant in which the Worthington Allspeed Drive could be used to advantage.

Write for literature . . . and ask the nearest Worthington office or dealer for a demonstration



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OUT OUR WAY
BY J. R. WILLIAMS
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WHY, IT'S FOR THE GOOD OF THE SHOP, FRANK... YOU KNOW THAT. MORE EXPERIENCED MEN ARE NEEDED ON THE NIGHT SIDE!
WAIT'LL FRANK FINDS OUT IT'S HIS OLD LADY THE BULL IS PUTTIN' ON HIS MACHINE!
YEH, AND WITH HER WORKIN' DAY SHIFT WHAT FRANK'LL REALLY HAFTA WORRY ABOUT IS THE HOME SHIFT!
J.R.WILLIAMS
THE BULL OF THE WOODS

We'll bet on the 'Old Bull' and his gang...

Their hands are more than full these days, but you can depend on them to keep things humming and our war production drive *in high*. It is this spirit and determination that is daily bringing Victory closer... and is uncovering new ways and techniques to do a *better* job, *faster*. For instance, we are now mass-producing *precision parts* at *low cost*. This is not only vitally important today... but it means much in the production of peacetime products after the war. It will enable millions to enjoy fine precision products that heretofore have been beyond their means... will mean a new and better way of living for everyone.

(*Below*) A few of the many thousands of our precision-made parts that help "Keep 'em flying and fighting."

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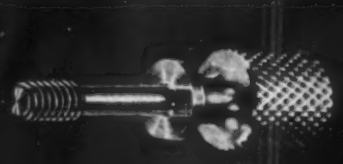

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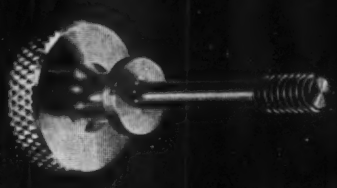

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Have Features a Plenty — Outstanding Performance

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These pumps give long, reliable service. Catalog listing complete pump line sent upon request.. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

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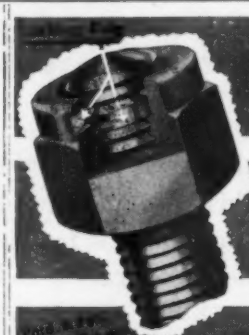

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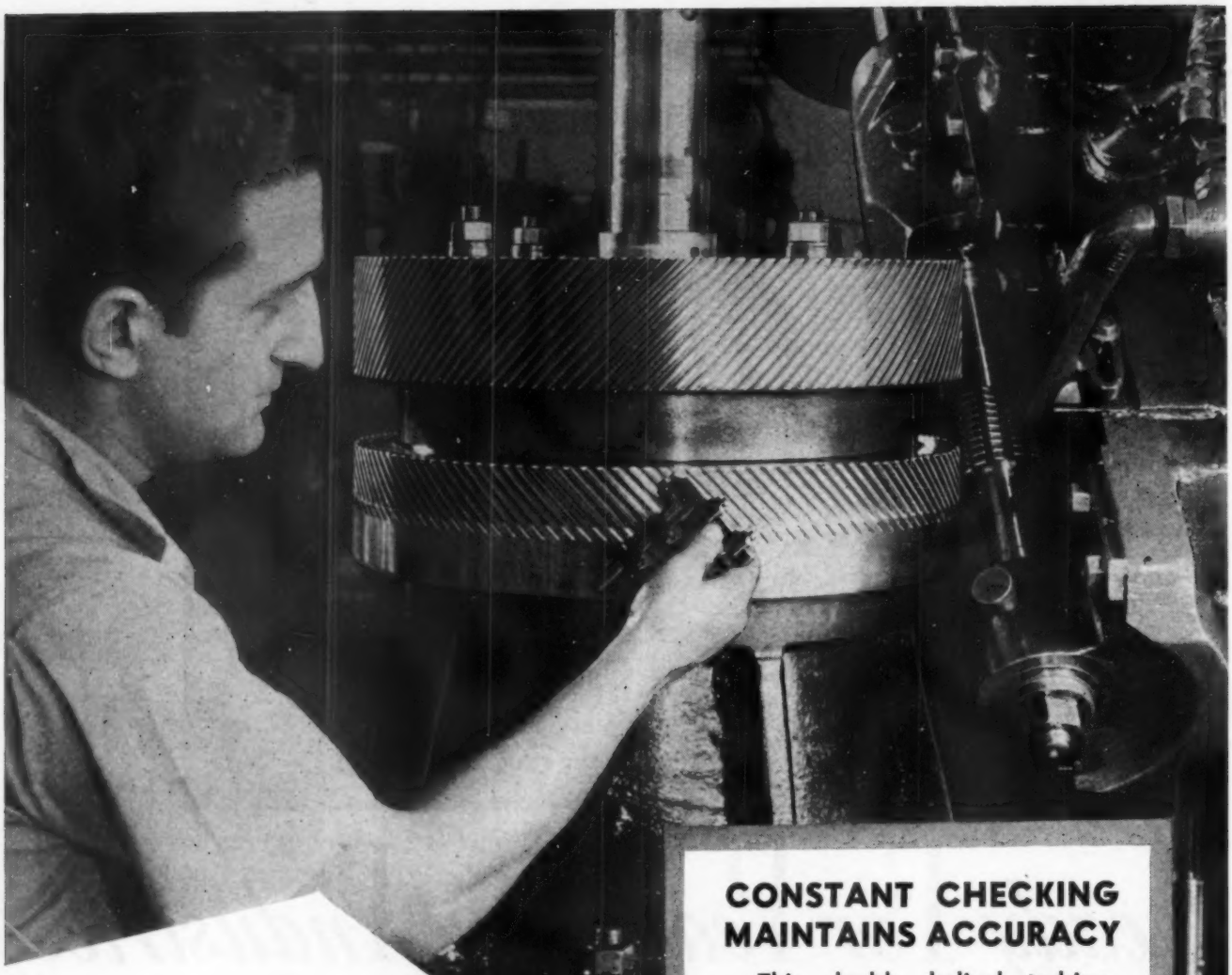

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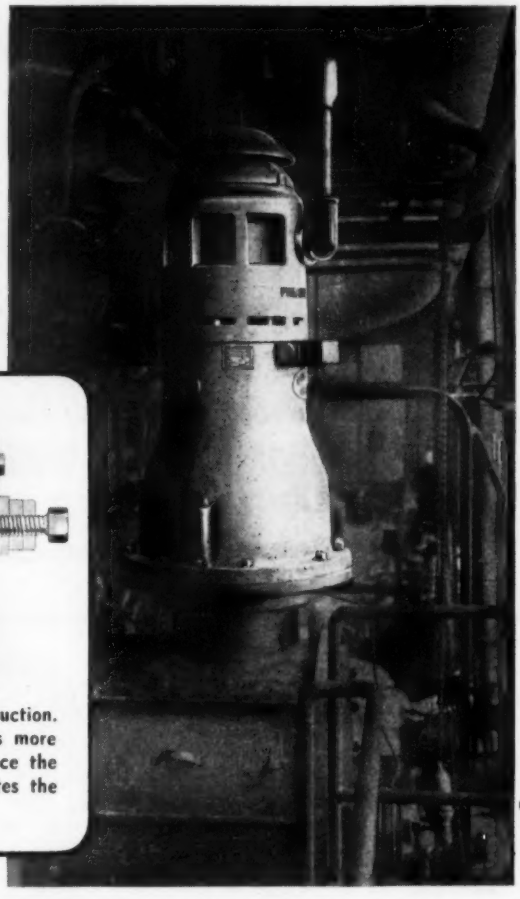

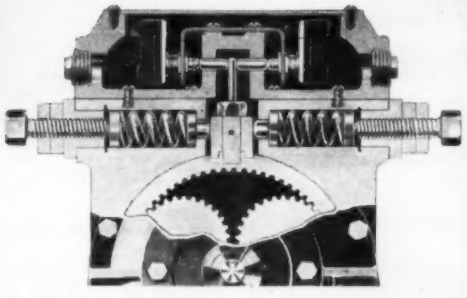

Cut-away view showing internal construction. PlaneTorque switch responds to overloads more quickly than electrical thermal relays since the mechanical action of the overload operates the cut out switch directly.

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The MotoReduceR with this feature can be had in both horizontal or vertical types in a wide range of ratios and horsepowers.

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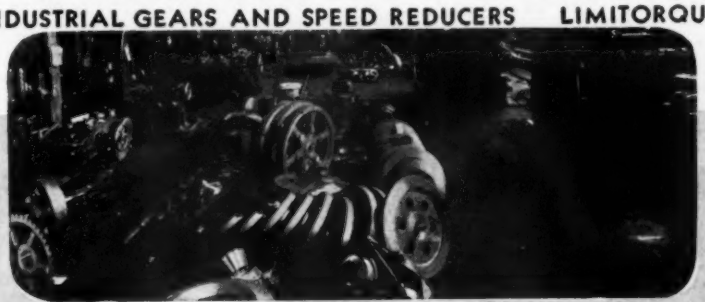

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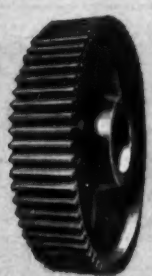

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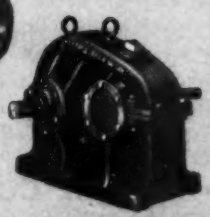

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The economical self-contained drive, Horizontal or Vertical types — various ratios and horsepowers.

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right angle drives — vertical or horizontal. Wide range of ratios and horsepowers.

"When your specifications call for special gears — Spur — Bevel — Mitres — Helical — Worms and Worm Gears —Reduction Units—Why not try GRANT.
You will find GRANT service meeting all requirements on both stock and special gears."
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(14 to 96 D. P.)

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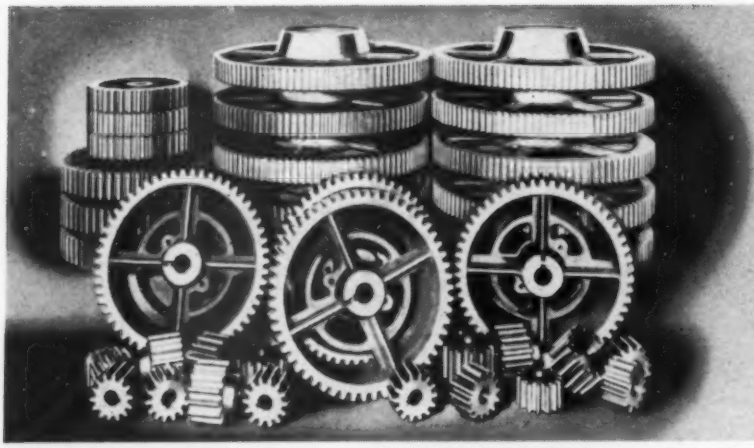
Ground Thread Worms

PERKINS PRECISION, CUSTOM-CUT GEARS

help power American Planes, Tanks and Guns

PERKINS MACHINE & GEAR COMPANY, SPRINGFIELD MASS.

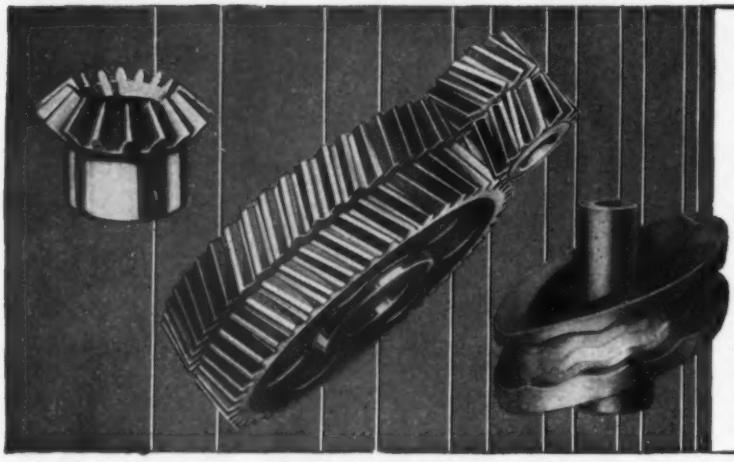


ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
Est. 1883
1942 Bridge St. Dubuque, Iowa



GET YOUR QUOTATION *from* "HARTFORD"

GEARS of every description cut to order
GEAR, CAM and THREAD grinding
AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

THE HARTFORD SPECIAL MACHINERY COMPANY
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IT HAS BEEN OUR PRIVILEGE FOR MANY YEARS...

The privilege of concentrating on assignments calling for high skill and precise accuracy in producing **Gears, Good Gears Only.**

This is known by many of the leading industries throughout the United States... It will be our privilege to work with you in helping to solve YOUR gear problems.

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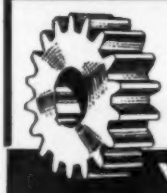
★ BEVEL
★ HELICAL
★ SPLINE
★ WORM
★ SPECIAL

THE CINCINNATI GEAR COMPANY
"Gears... Good Gears Only"
Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio

Let's
BACK THE ATTACK
***By Buying* WAR BONDS**

BRAWNY GEARS
PROMPT
ECONOMICAL SERVICE
ALL TYPES, MATERIALS
AND QUANTITIES
Ask for Estimate
BRAUN GEAR CO., 1590-1608 Atlantic Ave. Brooklyn, N. Y.



GEARED FOR VICTORY
Bevel-Spur-Worm-Helical
THE TAYLOR MACHINE COMPANY
1917 East 61st St. Cleveland, Ohio
"TAYLOR-MADE"

GANSCHOW GEARS
FOR SIXTY YEARS
Spur—SPEED REDUCERS—Worm
ALL TYPES OF CUT GEARS
GANSCHOW GEAR CO., 18 N. Morgan St., Chicago

More production per man hour is being obtained in war plants using Niagara Power Squaring Shears. Convenient operation, quick, accurate setting of ball bearing, self-measuring parallel back gage, full visibility of cutting line, instant-acting Niagara sleeve clutch and complete accessibility at rear are some of their modern features. Built in a complete range of capacities and sizes. Niagara Machine & Tool Works, Buffalo 11, N. Y. District Offices: Detroit, Cleveland, New York.

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory re-grinding service by the same skilled men who grind new Niagara knives.

BUY UNITED STATES WAR BONDS AND STAMPS

Demand these labels when buying uniforms

ARMY TWILL BY REEVES SANFORIZED* MADE TO GOVERNMENT SPECIFICATIONS

REEVES Glengarrie POPLIN

UNIFORMS OF REEVES ARMY TWILL CAN TAKE IT!

Men who handle machinery demand work uniforms that withstand heavy strain. So specify *Reeves* famous fabrics when ordering *your* uniforms.

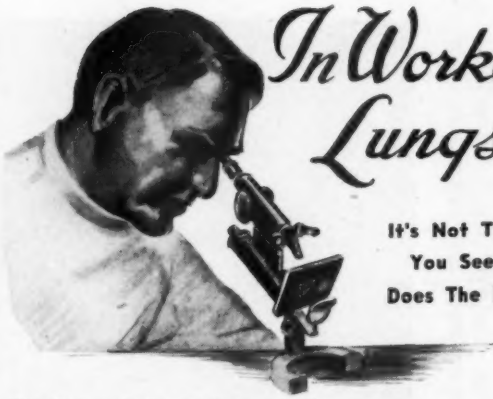
Uniforms made of Reeves Army Twill meet exacting U. S. Government Tests for better wear, longer life, color fastness. Its fabric vitality keeps "in shape." **GLENGARRIE POPLIN for matching shirts.** A durable, stylish fabric that comes in a wide range of colors. Both fabrics are Sanforized* against shrinking.

*Fabric shrinkage not more than 1%. (U. S. Government Test CCC. T-191-a.)

See your nearest dealer for uniforms, sport and work clothes made from these famous fabrics, or write for leaflet to:

OVER 60 million yards of Reeves Army Twill sold to the U.S. Army

REEVES BROTHERS, INC.
54 WORTH STREET NEW YORK



In Workers' Lungs—

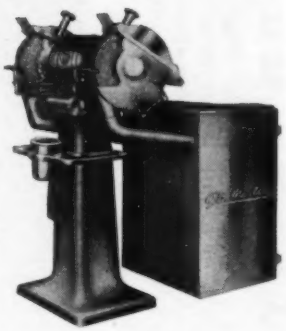
It's Not The Dust You See That Does The Damage

Silicosis is a deadly menace to workers' health and operative efficiency. Yet scientists have shown that it's not the dust you SEE around grinders and buffers that attacks men's lungs. Effective size range of dust particles causing silicosis is three microns* and under—far too small to be seen by the naked eye.

Don't be fooled, then, when the volume of abrasive dust and grit seen flying from buffers and grinders appears small. It's the dust you DON'T see that does the damage.

Protect workers' lungs—and expensive machinery, too—from the attacks of abrasive grit with the Cincinnati Air Master. It filters the air, returns it clean and free from dirt. Built in three sizes to fit all grinders and buffers. Write for details.

*Micron—1/1000 of a millimeter.



The Cincinnati

ELECTRIC DRILLS • GRINDERS • BUFFERS • PORTABLE TOOLS

The Cincinnati Electrical Tool Co.
DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

2676 MADISON RD

WALTHAM CYLINDRICAL SUB-PRESSES

Maintain high accuracy on long runs

Arch Type Sub-press

Production can be greatly speeded up through the use of WALTHAM SUB-PRESSES because the work turned out is ready for assembly without any delays incident to hand finishing or any other clean-up operation.

Fine quality work to highest precision standards can be produced without any special skill on the part of the operator—an outstanding advantage today because of the shortage of experienced help.

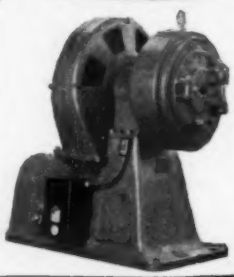
A simple and easy adjustment for wear assures a close, accurate fit of plunger in cylinder at all times and contributes to longer die life.

Made in sizes from 1.2" to 6" dia. plunger in Arch and Overhang Types.

ASK FOR COMPLETE INFORMATION

WALTHAM MACHINE WORKS
WALTHAM, MASS.

"Ask ETNA about Swaging"



● If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of ⅛" to 4" . . . larger sizes built to order!

Ask for our swaging catalogs

The ETNA MACHINE Co.
3400 MAPLEWOOD AVE. TOLEDO, OHIO

DANLY
PRECISION DIE SETS

DANLY MACHINE SPECIALTIES, INC.
2100 S. 52nd Avenue, Chicago, Ill.

MILWAUKEE • LONG ISLAND CITY, N. Y.
DAYTON • DETROIT • ROCHESTER
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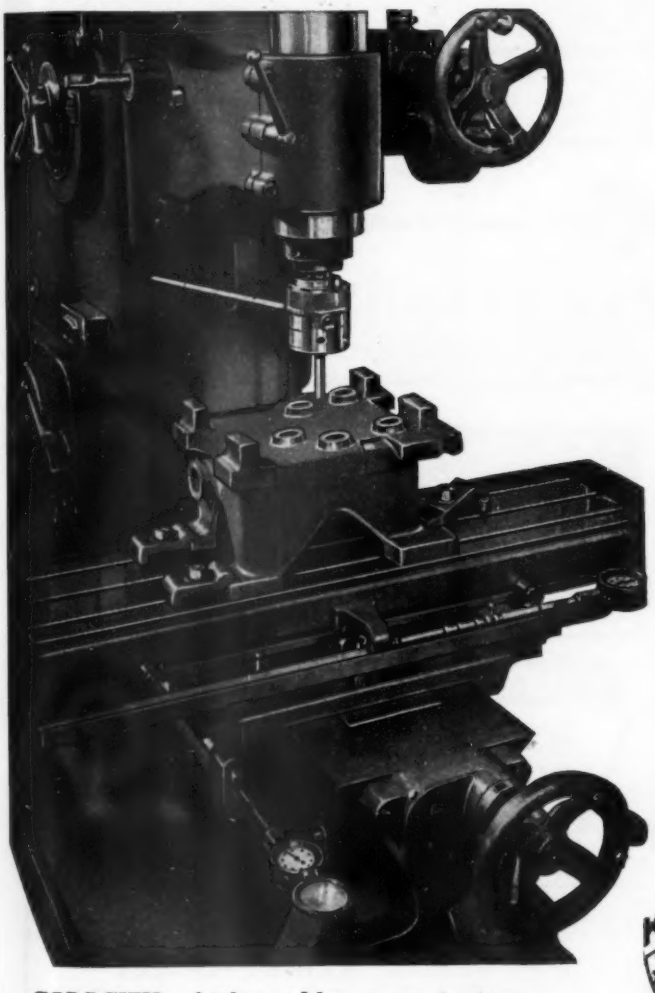
THEIR PRECISION
Means Greater Accuracy In Your Production

Danly Commercial Sets
Danly Special Sets

DANLY
DIEMAKERS' SUPPLIES

KNIGHT Millers....OFFER PRODUCTION ADVANTAGES IN MANY TYPES OF WORK



CAPACITY which enables users to turn out quality work at greater speed.

ACCESSIBILITY which makes possible more efficient operation — faster manipulation and quicker set-ups.

RIGIDITY to aid in increasing production volume and insure high standards of workmanship.

VERSATILITY gives these Millers capabilities which greatly simplify many set-ups that would otherwise be difficult to obtain.

ACCURACY that helps you turn out quality jobs and makes it easier for the operator.

- You can face work at an angle as easily and accurately as straight facing operations.

- When equipped with Dial instruments the KNIGHT Miller is especially adapted to jib boring. Quick, accurate work without the use of buttons or other time-consuming methods.

- For general tool room work the tilting and swiveling table of the KNIGHT Miller simplifies set-up and assures greater accuracy. The extreme versatility of the KNIGHT Miller is another important feature with regard to this type of work.

- You can rough and finish difficult forms easily, quickly, and with minimum adjustments in one setting in doing die and mould work.

- Costs on experimental work are greatly reduced because you can machine many jobs completely on this one machine and handle difficult operations without special equipment.

- For limited and special production you can keep costs down and maintain quality without special tooling. This is because the tilting table with Dial Indicators act as a Universal Jig and Fixture built into the machine.

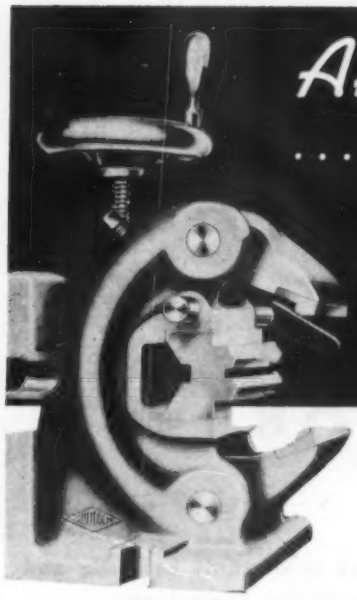
KNIGHT Miller's wide range of spindle speeds, solid table unit, and ease of handling make possible efficient production and accurate results on all operations. Where speed and convenience are required, KNIGHT Millers deliver — where power and rigidity are required, KNIGHT Millers are fully able.

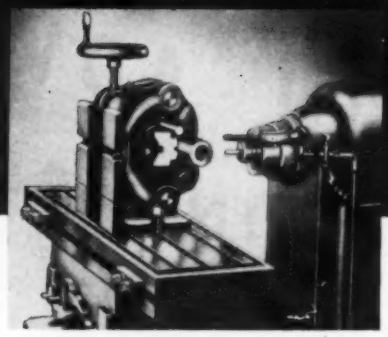
Write for catalog to get full details.

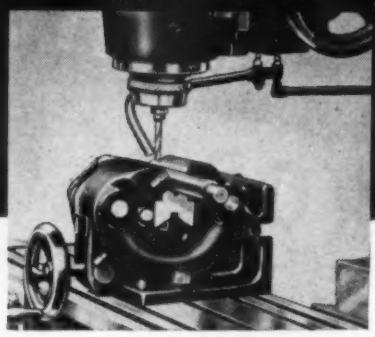
W. B. KNIGHT MACHINERY CO.
• ST LOUIS M[illegible] •

Another Need—Another Tool

. . . the NEW PRODUCTO SELF-CENTERING SHAFT VISE







Size of Base 8" x 7¼". Approximate weight 80 lbs. Write for Circular giving complete information.

A modern need has been met by PRODUCTO for a vise to hold shafts more securely and accurately and at the same time speed up keyway cutting and slotting. In this new SELF-CENTERING SHAFT VISE, PRODUCTO has applied its long experience in the design and development of machine vises to assure sturdiness, convenience and all-round utility.

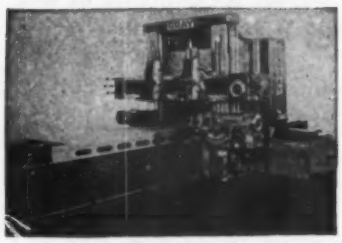
Handles sizes from ⅜" to 3½", diameter—can be mounted horizontally or vertically—setting remains the same for all work diameters—accurate radial cuts assured. Equal movement of two jaws correctly locates shaft in hardened V-jaw which is reversible in vise.

The PRODUCTO

PRODUCTO MACHINE COMPANY

990 HOUSATONIC AVENUE, BRIDGEPORT, CONNECTICUT — 3017 MEDBURY AVENUE, DETROIT, MICHIGAN

THE GRAY LINE



PLANERS

MILLING PLANERS

MILLING MACHINES
(Planer Type)

HORIZONTAL BORING MACHINES
(Floor Type)

Write for bulletins giving detailed specifications

The G. A. GRAY CO.
CINCINNATI, OHIO

PRESSES
FEEDS
AUTOMATIC EQUIPMENT
THE V & O Press Co.
HUDSON N Y

BAUMBACH
STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST

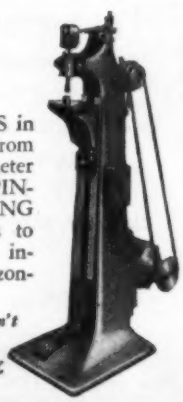
46 Styles—195,000 Sizes

E. A. BAUMBACH MFG. CO.
Machined Steel — Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

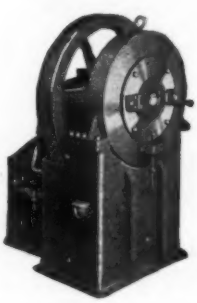
GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



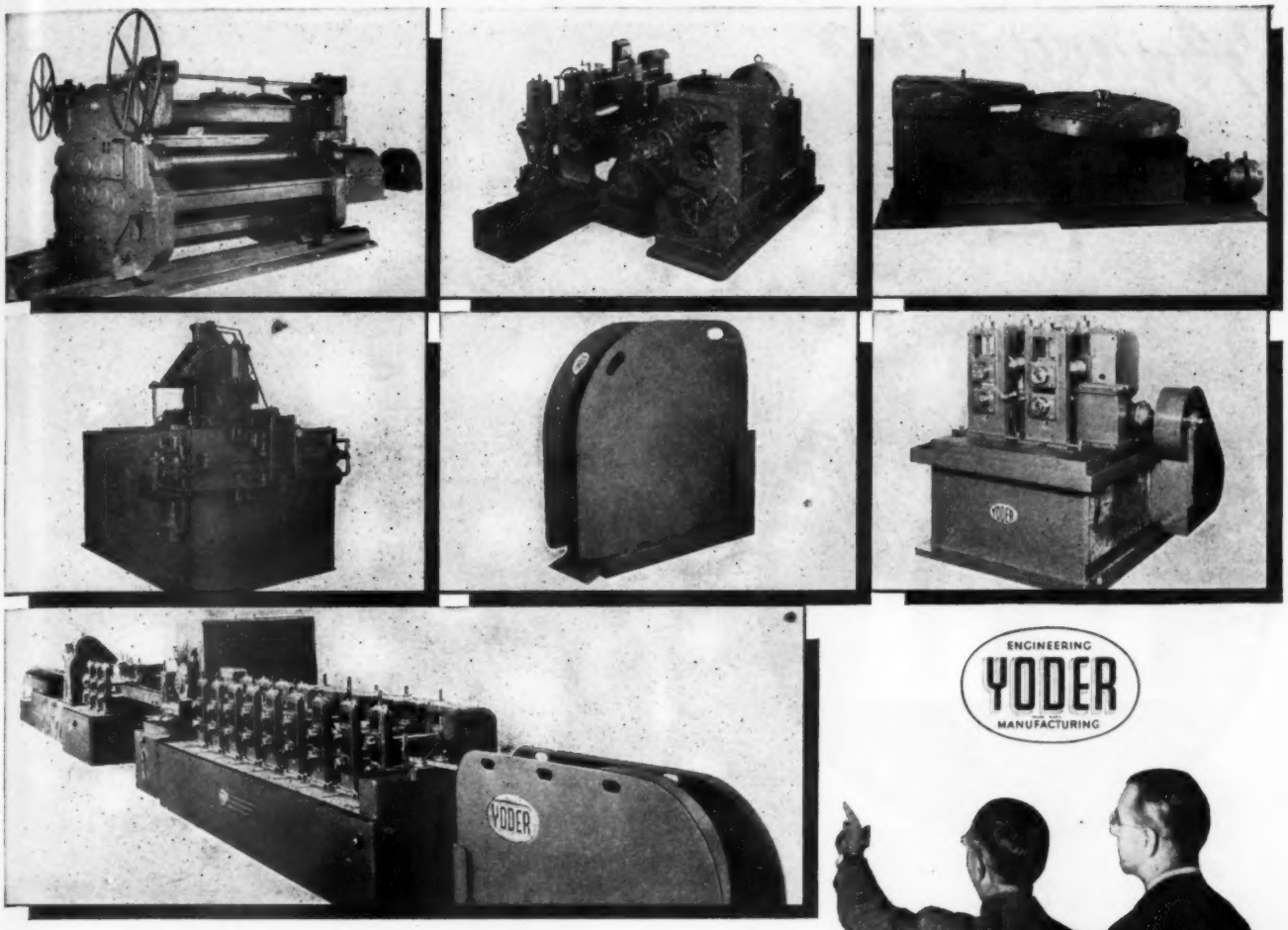
THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.



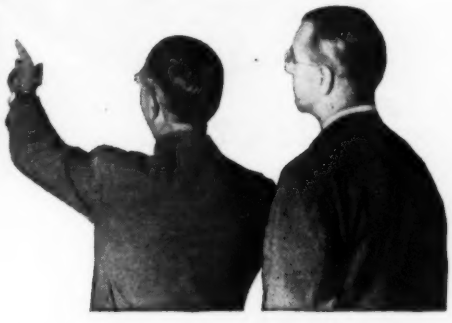
THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street — Torrington, Conn.



ENGINEERING YODER MANUFACTURING



YES,

it's no "secret weapon" . . . everybody knows that when it's a YODER, it's a "GOOD" machine. When it is a "LATE" YODER, you can be sure it has a greater number of improvements designed and built into it, than any similiar type of machine. WHEN you plan, permit YODER organization to help with recommendations and quotations. Just send us your rough notes, blueprints and sketches, where metal working machinery is concerned . . . we'll go right to work! . . . and thanks for the opportunity. We have a catalogue for distribution, too.

THE YODER COMPANY · CLEVELAND, OHIO, U. S. A.

ENGINEERING

YODER

TRADE MARK

MANUFACTURING

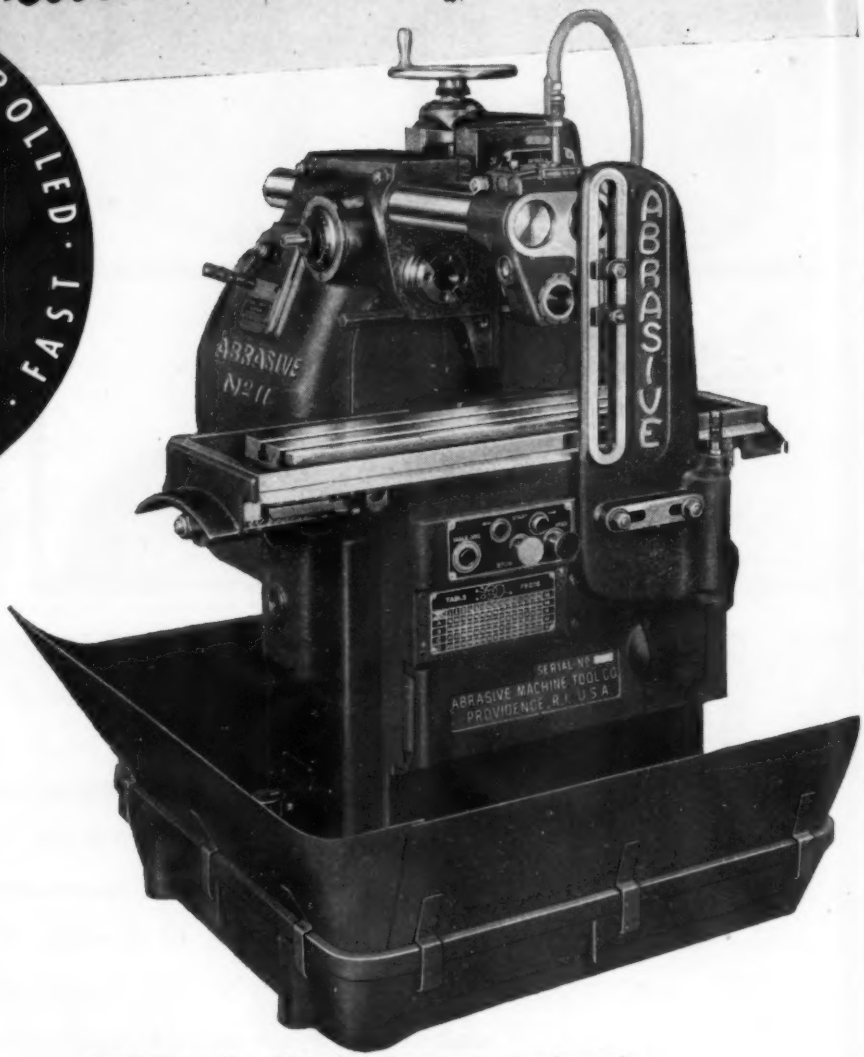
HIGH PRODUCTION METAL WORKING MACHINERY

Announcing

ABRASIVE Plain Milling Machine

ELECTRICALLY CONTROLLED · FAST · EFFICIENT · FLEXIBLE

B11



No. B 11 provides wide variety of automatic operating cycles. Electric station and dogs control all power table movements.

Features

- Full Electrical Control
- Smooth, Quiet Operation
- Flexible, Efficient
- Easy Operation
- Safety Features
- Low Maintenance Costs
- Climb Milling in either direction
- Automatic Reverse
- Fast Table Travel of 300" per minute
- Wide selection of Feeds and Speeds

Designed and developed recently by Brown & Sharpe Mfg. Co., this new manufacturing-type milling machine is made by ABRASIVE to ABRASIVE's high standards. It is exceptionally compact, rugged and flexible . . . provides complete electrical control for table and spindle power movements and a capacity ample for most work of medium size. Engineered for easy operation and high production, this new machine answers ideally all ordinary milling requirements.

For complete details and specifications write for descriptive Bulletin.

ARMY E NAVY

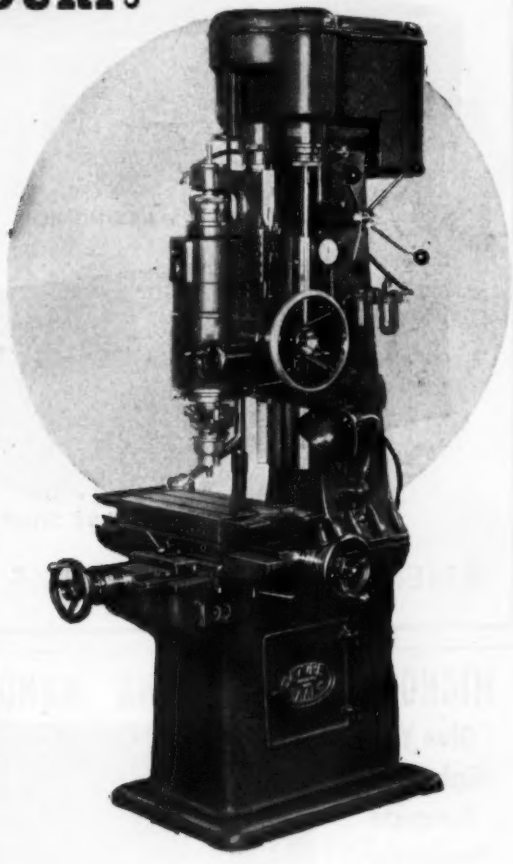
ABRASIVE MACHINE TOOL CO.

Dealers in Principal Cities

EAST PROVIDENCE · · RHODE ISLAND

"Show Me!"

SAID THE MAN FROM MISSOURI.



. . *and*

THE MOORE JIG GRINDER DID *Just That!*

MAN FROM MISSOURI:
"I may as well be frank. I'm from Missouri, and I doubt your claims for accuracy of hole location with the Moore Jig Grinder."

MAN FROM MOORE:
"We don't blame you. You've had years of experience in tool and die and gage work, and you can appreciate the difficulties involved. Such hole-location precision can't be accomplished in any other way."

MAN FROM MISSOURI:
"I came here to see you grind the ten holes in these two pieces to tolerances of less than .0001", as you claim. I'll stay right here and see it done. How long do you think it will take?"

MAN FROM MOORE:
"About 4 hours."

MAN FROM MISSOURI:
"O.K. Grind the holes to the size of these plugs. If you can start right away, the job should be finished before 6, my train time."

The two pieces, shown at left, had been jig-bored, hardened and seasoned. They were strapped on the Jig Grinder table side by side, and from then on treated as one solid piece. *The ten holes were ground to size and location in 3½ hours.* The Man from Missouri did not move from the machine.

"Here, check them yourself," said George Lamb, our operator, as he handed over the parts.

The Man from Missouri first tested each hole for size, and found the plugs wrung snugly in each hole with no "bell mouth." He then plugged them together. They all plugged one way, so he reversed the two parts and found they also plugged that way. He continued testing the job by plugging the parts together in all of the six possible combinations.

Fully convinced, the Man from Missouri returned to his plant, and a few days later another Moore Jig Grinder order was entered.

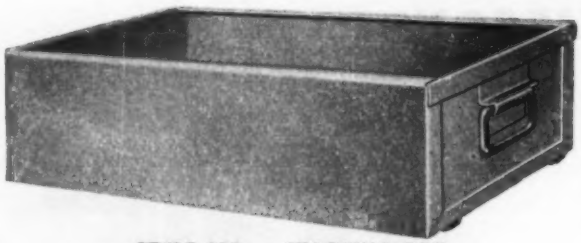
That's the way we like to sell our machines...by actual demonstration.

MOORE SPECIAL TOOL COMPANY INC.
740 UNION AVENUE, BRIDGEPORT 7, CONN.

IMMEDIATE SHIPMENT

STEEL BOXES

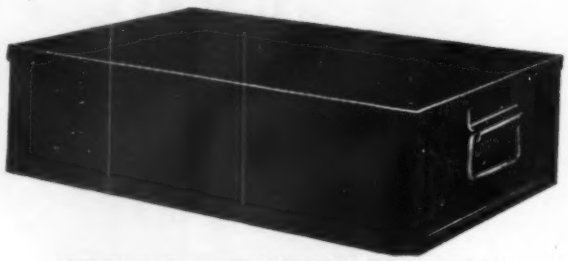
FOR YOUR PRODUCTION NEEDS



STYLE 300 — STACKING BOX

Just right for your small parts. Light in weight, easy to handle. Equipped with drop handle each end. Runners save wear on bottom of box and act as positive stacking lock.

No. 301	6" x 9"	x 3½"	20 ga.	$ .55 Each
No. 302	8" x 12"	x 4"	20 ga.	$ .60 Each
No. 303	9" x 13½"	x 4½"	19 ga.	$ .75 Each



STYLE 200 — STRAIGHT SIDE SHOP BOX

A straight side shop box with drop handles each end. Excellent for shop use where stacking feature is not required.

No. 201	6" x 9"	x 3½"	20 ga.	$ .40 Each
No. 202	8" x 12"	x 4"	20 ga.	$ .45 Each
No. 203	9" x 13½"	x 4½"	19 ga.	$ .60 Each

Prices F.O.B. Factory, Phila. — Any Quantity!

Order Today — Write, Wire or Phone

AMERICAN METAL WORKS, INC., **1509 Germantown Ave., PHILADELPHIA 22, PA.**

NICHOLSON EXPANDING MANDRELS

Give You High-Speed Accurate Production

Equip your shop with these economy tools for holding work while being machined. Hardened tool steel—precision ground.

Two Types—All Sizes—Sold Singly or in Sets—Bulletin No. 10-43

W. H. NICHOLSON & CO.
114 OREGON ST., WILKES-BARRE, PA.

Other Products: Arbor Presses—Control Valves—Steam Traps—Etc.

Wanted! New Products!

Long-established and well-known company with modern plant for production of precision devices wants new products for post-war manufacture. Particularly interested in small and medium-sized motor-operated tools or appliances. Ideas need not necessarily be completely developed. Send only description of product, indicating purpose, market and advantages for complete, prompt, and confidential consideration. If your idea has possibilities, and will fit into our plans, further arrangements can then be made. Address Research Department,

The Dumore Company, Racine, Wisconsin

BUZZER *Reg U.S. Pat Off* INDUSTRIAL *Gas* EQUIPMENT

No Blower or Power is needed to reach High Temperatures with a "BUZZER" Gas Furnace . . . just connect to your gas supply.

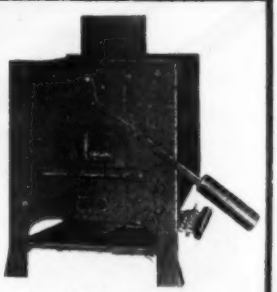
Rectangular Heat Baths

For liquid heat treating baths, soft metal melting, etc.

The High Speed Full Muffle Furnace attains a temperature of 2400° F., and is designed for High Carbon and Alloy Steels.

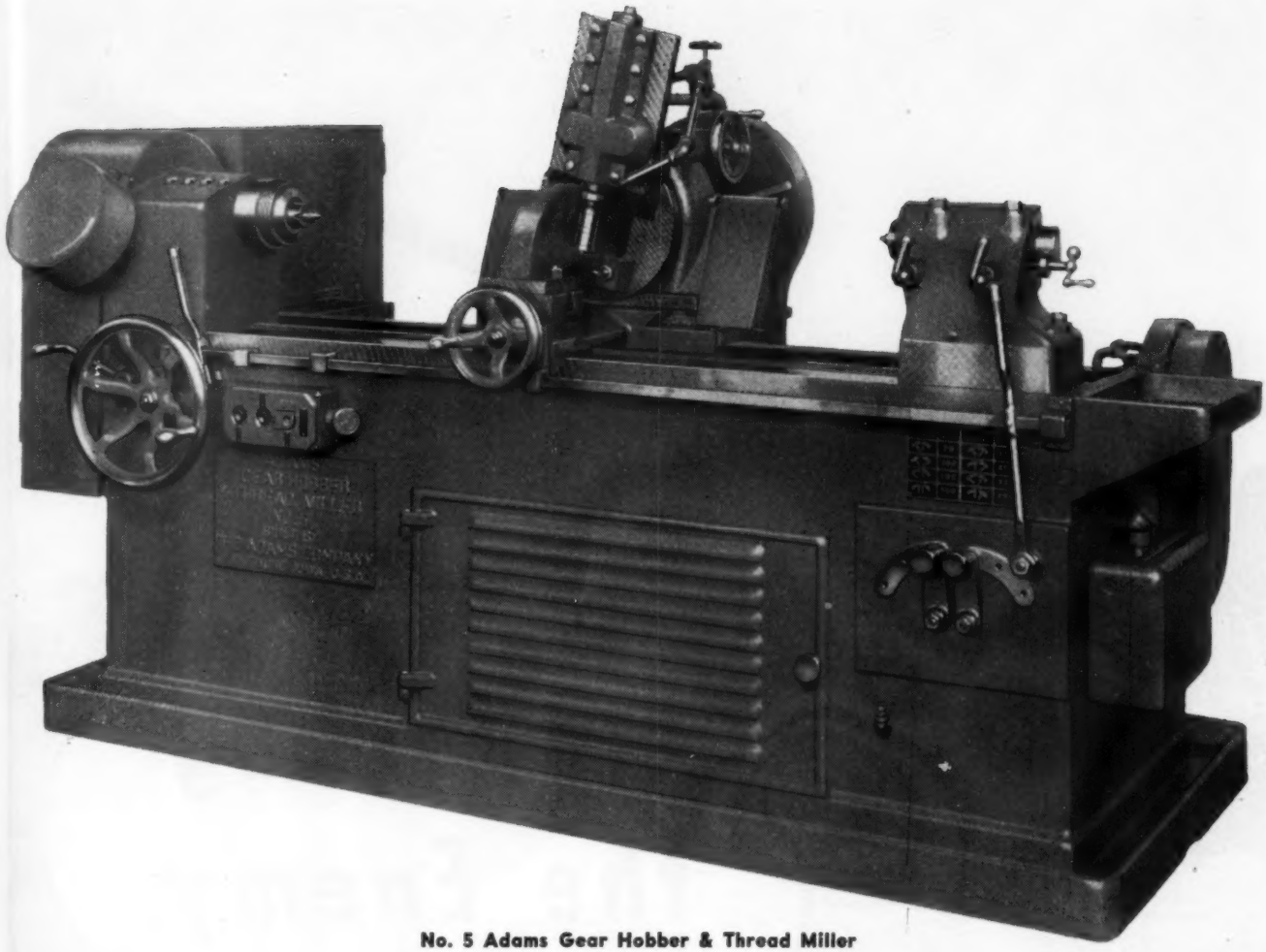
BUZZER Rectangular Heat Baths meet the increasing demands for large liquid Heat Bath Furnaces, and are built in many sizes. Also made in round type pot furnaces

Send for the new BUZZER Catalog showing full line of Gas Furnaces, Burners and other equipment.



Full Muffle Furnace (Bench Type)

CHARLES A. HONES, INC.
121 South Grand Avenue **Baldwin, L. I., N. Y.**



No. 5 Adams Gear Hobber & Thread Miller

Precision Gears and Splined Shafts for the Aircraft Industry

The unprecedented demand placed on the aircraft industry for production and more production has created a need for machines that can be relied upon to turn our precision parts consistently with a minimum of skill required on the part of the workman.

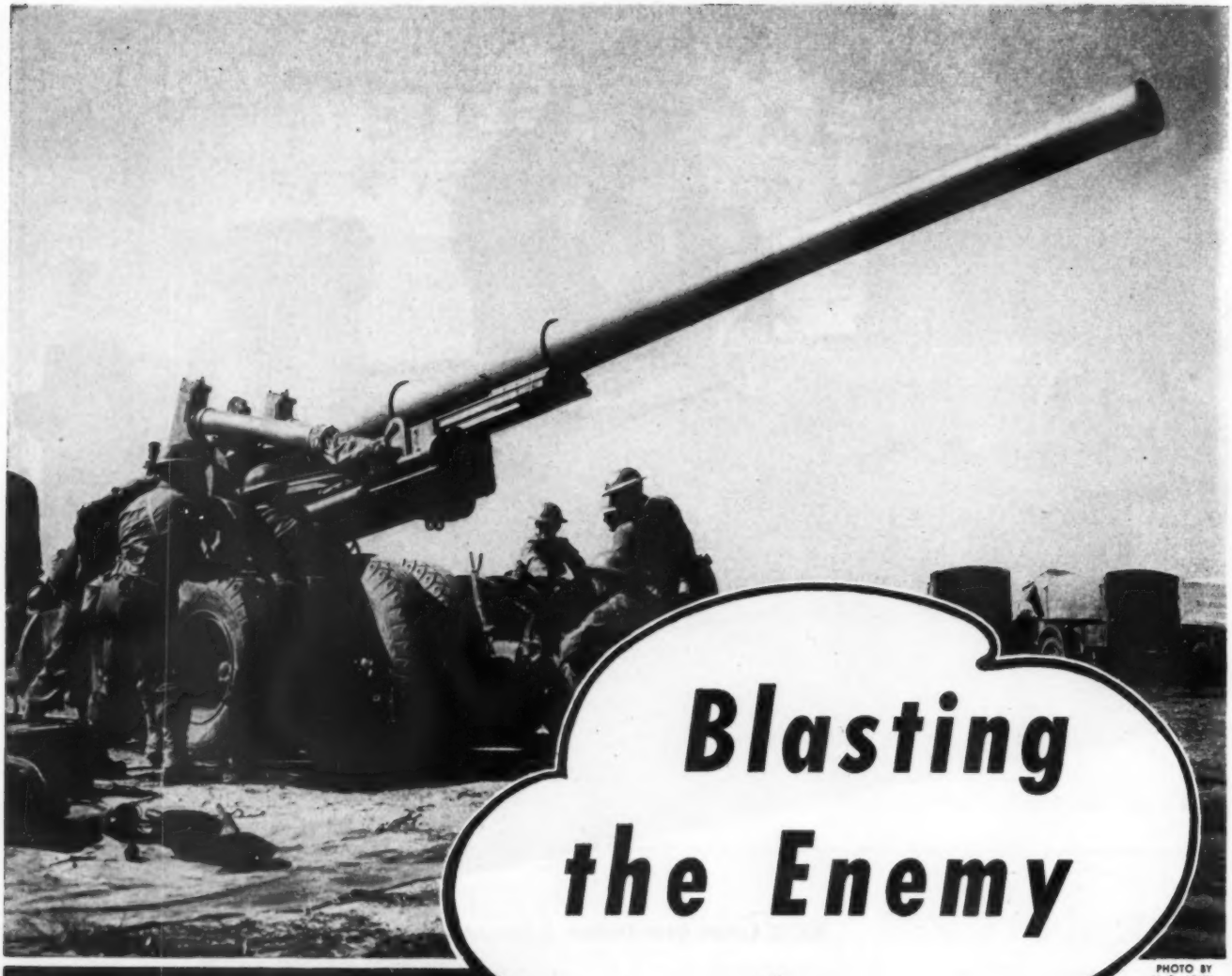
The Adams Gear Hobber & Thread Miller combines precision with versatility. The hobbing of splined shafts, spur gears and helical gears—the milling of worms and screws—these are all operations that can be performed profitably on this dependable machine.

The Adams Manufacturing Hobber is offered when there is a sufficient volume of splined shaft and spur gear hobbing to warrant the installation of equipment for these operations only.

Let us send you specifications on these modern machines. Ask for Catalog No. 501.

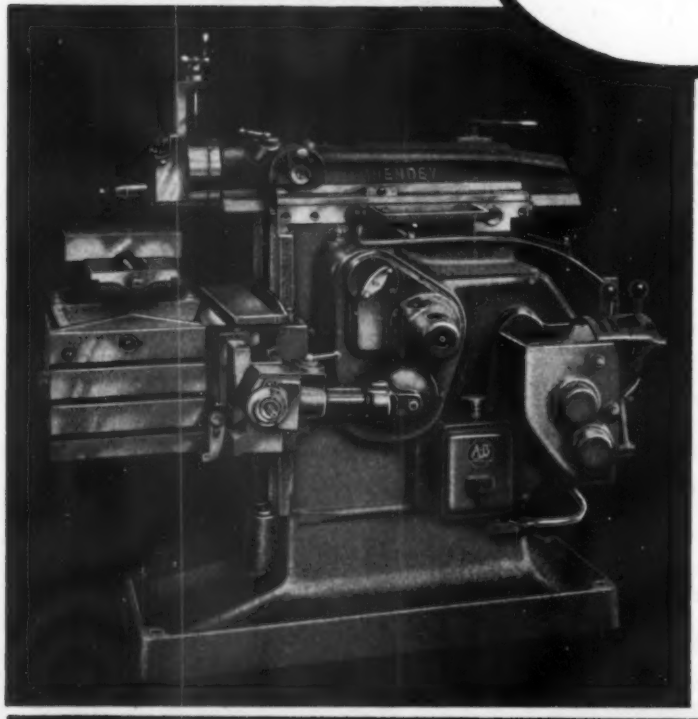
THE ADAMS COMPANY 1905 BRIDGE STREET DUBUQUE, IOWA, U.S.A.

1883 — Our 60th Year — 1943



Blasting the Enemy

PHOTO BY U. S. ARMY SIGNAL CORPS



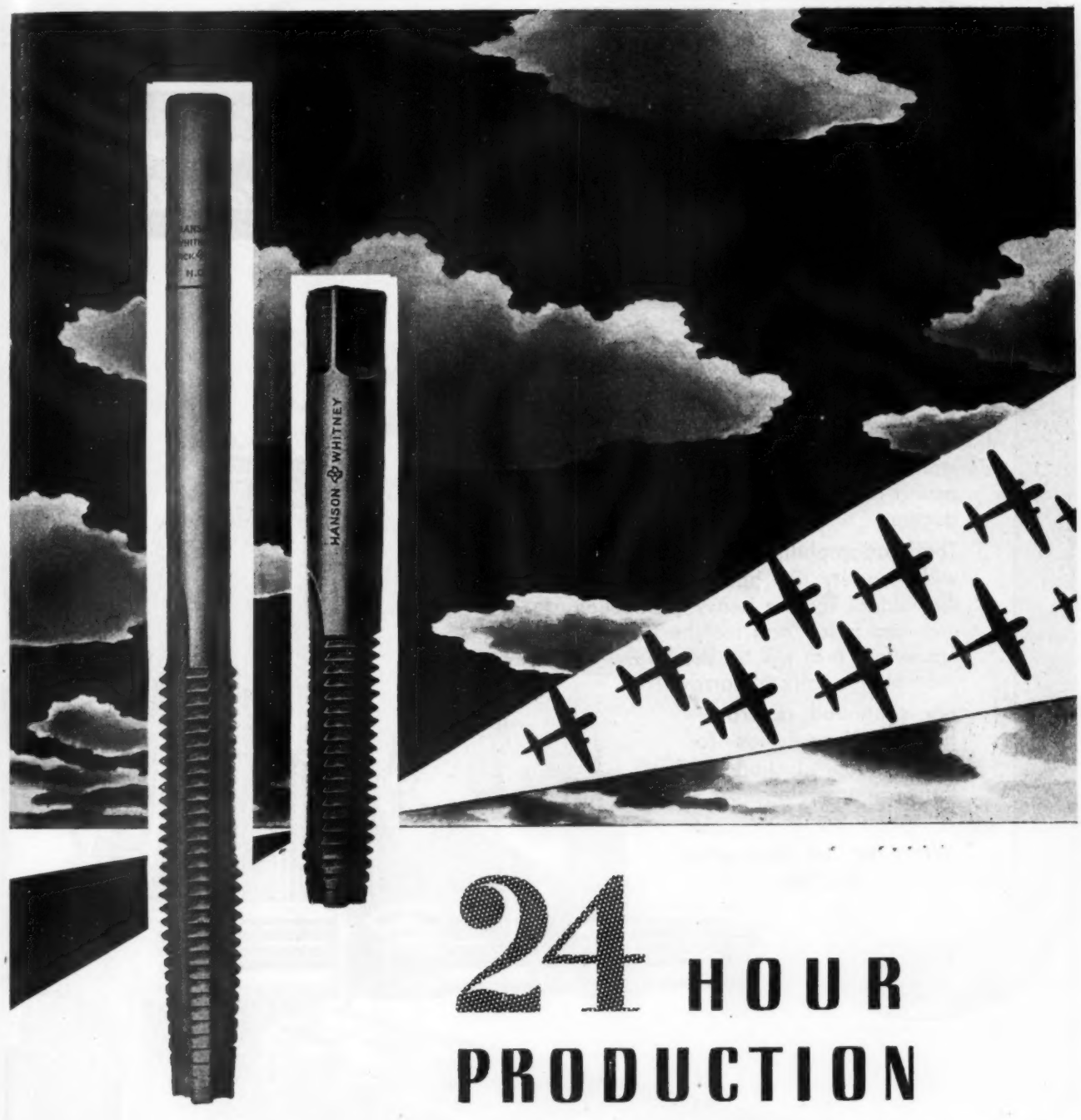
In the making of these 155 mm. guns there must be machine tools to do the job. Hendey 12" Crank Shapers have a definite place in the war production program, making precision parts for guns, tanks, ships and planes. 69 Years of manufacturing experience have built dependability into these Hendey Shapers. . .

WE ARE STILL AT WAR!

1874 - - - - - 1943

THE HENDEY MACHINE CO., Torrington, Conn., U.S.A.

BOSTON • NEW YORK • ROCHESTER • DETROIT • CHICAGO



24 HOUR PRODUCTION

"Impossible" delivery schedule? Specify H-W! H-W Taps deliver long, accurate runs between grinds . . . minimize down time and reduce rejects. And H-W Taps retain precision longer . . . because the "Hanson Process," our exclusive method of finishing after hardening, insures uniform grain structure from tip to shank. If you have a tapping problem, write or wire . . .

ARMY E NAVY

THE HANSON WHITNEY MACHINE CO.

HARTFORD CONNECTICUT U.S.A

CLEVELAND
Open Side
PLANERS

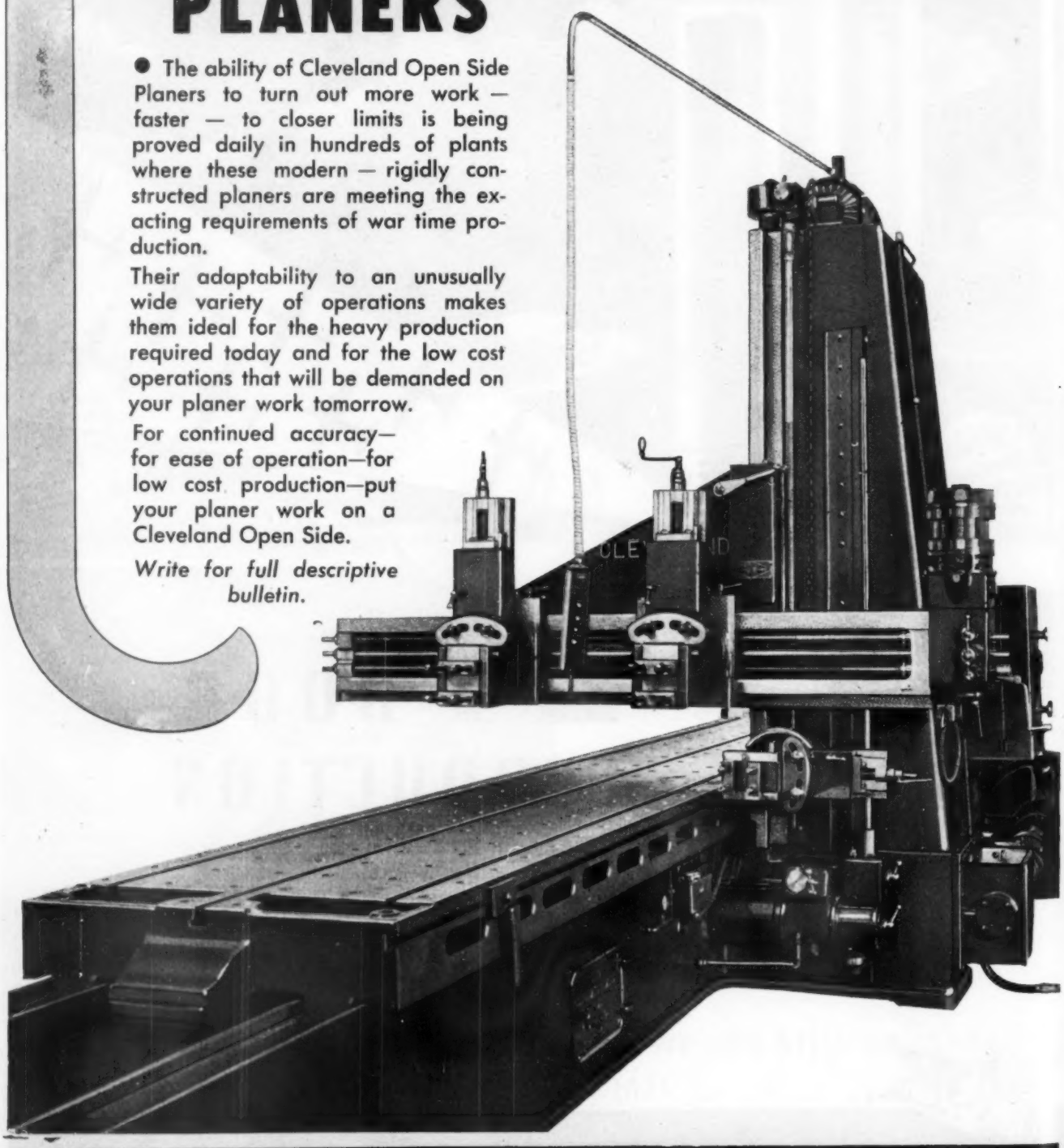
Turn out more work — Faster—to closer limits

● The ability of Cleveland Open Side Planers to turn out more work — faster — to closer limits is being proved daily in hundreds of plants where these modern — rigidly constructed planers are meeting the exacting requirements of war time production.

Their adaptability to an unusually wide variety of operations makes them ideal for the heavy production required today and for the low cost operations that will be demanded on your planer work tomorrow.

For continued accuracy—for ease of operation—for low cost production—put your planer work on a Cleveland Open Side.

Write for full descriptive bulletin.



THE CLEVELAND PLANER

3148-3156 SUPERIOR AVENUE • CLEVELAND, OHIO

SUNNEN PRECISION HONING MACHINE for Jobs Like These—

Range Handles any internal diameter from .185" to 2.625" without jigs or fixtures.

Accuracy Guaranteed accuracy to within .0001" — has often been held to .000025".

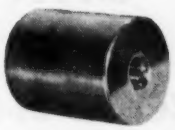
Finish Produces super-smooth finish of 2 to 3 micro-inches.

Price The initial cost is low, and it's economical to operate. Basic price —

$195.00

Compressor Yoke. Alignment maintained and better finish produced.

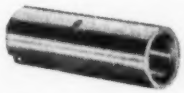
Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter—held to .0002", stock removal .001", sixty per hour.



Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

Shell Loading Die.

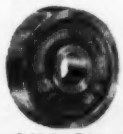
Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.



Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Cast Iron Valve Stem Guide. ½ to one thousandth removed—220 pieces per hour. Better finish and straighter hole.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.



Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

Bearing. A very small part. 2 micro-inch finish necessary.

SUNNEN

The coveted Army-Navy "E" waves over the Sunnen plant—evidence of the important part Sunnen equipment is playing in the war effort.

The Sunnen Precision Honing Machine has been found ideal for handling such parts as are illustrated above. No jigs or fixtures are needed, work is held in the hands. It often does the work of big internal grinders — relieves them for other jobs.

Skilled labor isn't necessary to operate the Precision Honing Machine. Girls in 'teens can handle jobs in "tenths" within a few hours.

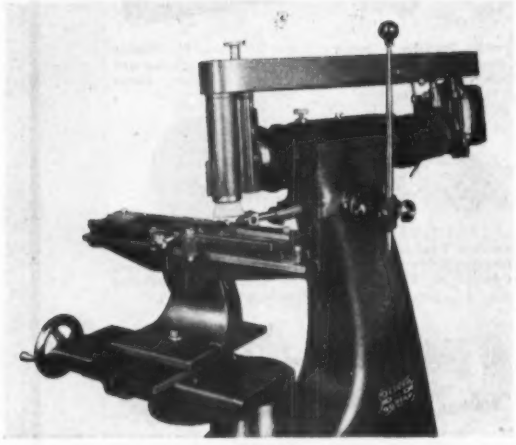
The greater accuracy and super-smooth finish assures absolute interchangeability of parts. It also assures fewer rejects — conserving vital materials and boosting production.

Write for complete information — or let a Sunnen engineer show you, in your plant, on your parts, what this machine will do.

SUNNEN PRODUCTS COMPANY • 7941 Manchester Avenue, St. Louis, Missouri

Canadian Factory: Chatham, Ontario

PRECISION
TOOL AND CUTTER GRINDING
"the Oliver Way"



BROACH GRINDING FIXTURE

The cut above illustrates a special attachment available with the Ace Grinder—a Broach Grinding Fixture for Flat Broaches. For grinding in the throat, maintaining the original spacing of teeth or on the clearance surface of the teeth, maintaining accurately the variation in height between successive teeth. Any reasonable length broach may be ground.

The above view illustrates THE OLIVER ACE TOOL AND CUTTER GRINDER, *with centers in position* for grinding reamers, slitting saws, angular cutters, slab mills, side mills, formed cutters, double angle cutters, etc.

A second fixture, a part of the regular equipment, is also mounted in the angular fixture for grinding end mills and cutters with shanks.

The OLIVER ACE is *known and recognized* for its SIMPLICITY, ACCURACY, EASE OF SETUP AND OPERATION. Just two simple fixtures to handle the general run of milling cutters.

Any combination of angles is immediately available to the operator. Compound angles are obtained by direct reading.

THE OLIVER ACE is **tops** for both large and small shops, for cutter reconditioning and cutter manufacturing. It is readily adaptable to individual cutters or quantities of similar cutters.

Send for literature today—and obtain the latest information on the Modern Oliver Way of Cutter Sharpening.

Don't Neglect Your Toolroom It's the Backbone of Production!

OLIVER INSTRUMENT CO.
1414 EAST MAUMEE STREET
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Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

LIBERTY CUTTING ACCURACY

...also CUTS COSTS!

MAXIMUM RIGIDITY, NO TWISTING AND SPOILAGE UNDER HEAVY STRAIN.

AUTOMATIC CONTROL—QUICK, EASY, PRECISE, CONSERVES MAN-HOURS.

ACCURACY TO CLOSE TOLERANCES FULL LENGTH OF CUTTING STROKE. WORKS CUTTING TOOLS TO FULL CAPACITY.

PRIMARY HERRINGBONE GEAR DRIVE APPLIES POWER SMOOTHLY, DIRECTLY, WITHOUT VIBRATION, ASSURING MAXIMUM PRODUCTION VOLUME.

Saving man-hours, when manpower is limited, is a plus advantage you get from operating a Liberty Planer. Every operation on a Liberty is accurately, instantly and AUTOMATICALLY controlled so that *rapid,* precision output is assured from the start.

Tools can be quickly set for the various cuts within the wide scope of the Planer—with friction feed and a pneumatic tool lifter to further speed production, reduce time between cuts, and conserve operator's energy.

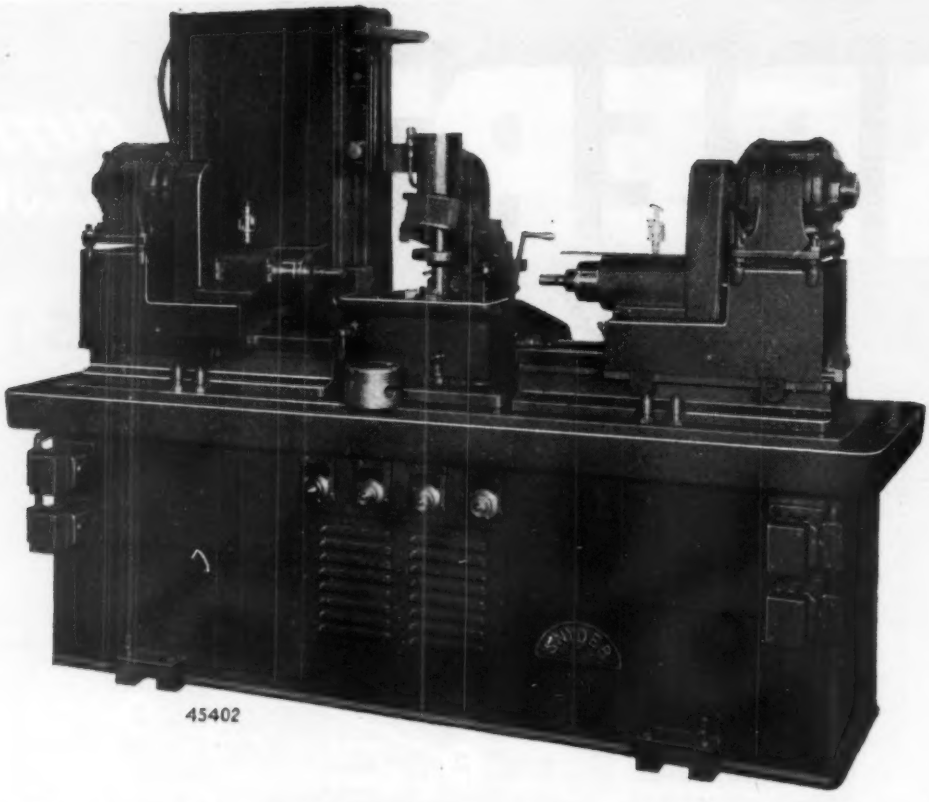
A Liberty Planer in *your* plant will help beat the Axis now . . . and then help you beat peacetime competition. Write for Catalog 155, and facts about our engineering service.

ready for delivery

LIBERTY PLANERS

HAMILTON, OHIO ★ U. S. A.

Over A Quarter Century of Specialized Experience with Time-Tested Principles of Design



Two-Way Hydraulic Precision Counter-Boring Machine by Snyder

This special-purpose machine was developed to counterbore both ends of wrist-pin holes in aircraft pistons.

The piston is loaded manually and located by means of a pilot entering the piston. Two manually operated locating fingers are used to square up the center line of the holes. Hydraulic clamping mechanism is controlled by electrically operated valves and the push-buttons controlling this mechanism are inoperative while the machine is in the work cycle.

The work cycle consists of rapid approach and feed to the required depth, against solid stops, feed return for the length of the counterbore and rapid retraction to the rear of the slide, allowing ample loading clearance. Feed in both directions is employed to assure high quality finish, without tool marks.

Tools are single point tungsten carbide tipped. Spindles are precision "Parker," with direct v-belt drive from electric motors.

All hydraulic equipment is housed in the base. Coolant is contained in a separate tank in the rear of the machine and is fed to the work through the fixture, to the inside of the piston.

This is a typical example of the application of Snyder engineering to an operation in which precision and quantity production both are required.

ABOUT YOUR POST-WAR PLANS . . .

It's good policy to plan your production when you plan your product because, when the two are planned together, the product can be adapted to the production machines and the machines to the product as you go along. Thus, you can eliminate those unpredictable difficulties which so often arise when these plans are made separately.

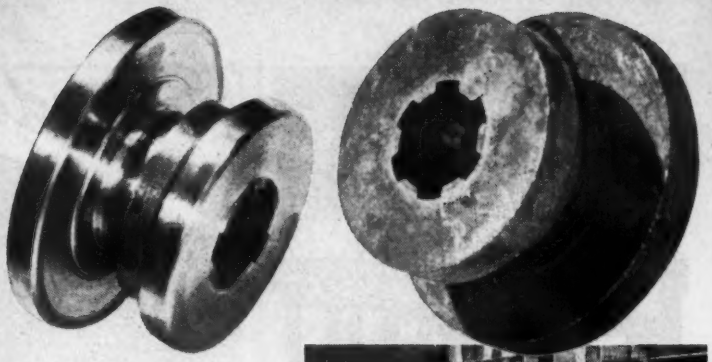
Snyder engineers are ready to consult with you now on production plans for your post-war products. Send your prints and describe your project. Consultation implies no obligation.

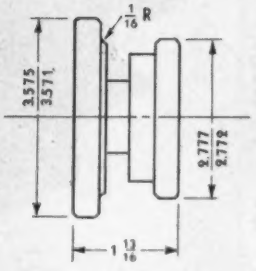
SNYDER TOOL & ENGINEERING COMPANY
3400 East Lafayette — Detroit 7, Michigan

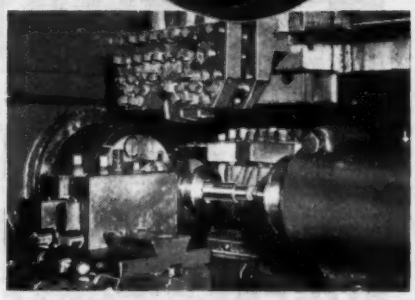
SNYDER

DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION *AT LOW UNIT COST*

Here's Another Saving on Short-Run Turning!







Sundstrand Automatic Lathe With 3-Tool Slides . . . Cuts Turning Time 40%

Gear blanks like these are difficult to machine in one setting because of the number of cuts required. If only two tool slides are used, the tool bits themselves are limited in size and strength. Consequently, the cuts are too heavy, cause chatter, spoil the finish, lower production and tool life.

In this installation the Sundstrand Model 10 Automatic Lathe is provided with three standard tool slides. This makes it possible to distribute the cuts evenly, use heavier tool bits and utilize maximum cutting feeds and speeds. As a result, the cutting time on lots of 140 pieces has been reduced 40% from the former method.

250 Other Jobs Turned on Same Sundstrand Lathe

These are some of the many gear blanks turned on the Sundstrand Automatic Lathe. In addition to handling all of the more difficult jobs as described, the Sundstrand is also utilized for turning more simple gear blanks. In this way the manufacturer is provided with an automatic lathe capable of handling practically any gear blank job in both small and large lots.

Lot Size Ranges From 50 to 400 Pieces

Since this manufacturer builds several different types and models of machines, a great number of various types and sizes of gears are processed through the Lathe Department. The Sundstrand is able to handle these faster, in spite of small lot sizes, because of the ease and speed with which it can be changed over from one job to another.

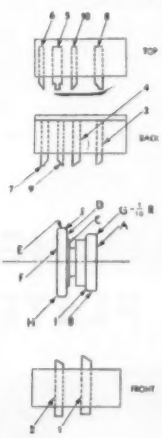
Quick Cycle Change For Faster Set-ups

Quicker set-up and easy change-over are possible because of the Sundstrand simple cycle control. This control eliminates making cams for every job to be turned. It provides complete control of all cycles by simple adjustment of dogs on a disk. Edge of disk is graduated for ease and speed in setting up cycles, and changing from one job to another.

TOOLING

Method used to set up the three tool carriages for this job. Complete set-up time for machine cycle and tools is only 1½ hours.

OPERATIONS



1-TOP
Tool 5 Faces Groove C
Tool 6 Faces F
Tool 8 Forms Radius G
Tool 10 Forms Chamfer I

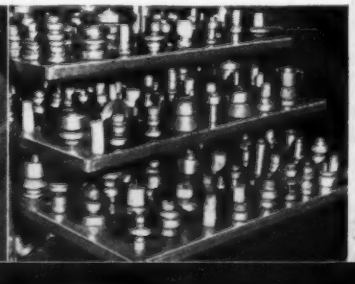
2-BACK
Tool 4 Faces D
Tool 3 Faces A
Tool 7 Forms Radius H
Tool 9 Forms Chamfer J

3-FRONT
Tool No. 1 Turns O. D. B.
Tool No. 2 Turns O. D. E.

Below: 3 tool-heads cut simultaneously

Left and Below: Quick set-up for short runs is accomplished by simply adjusting dogs on a graduated disk.

Below: Some of the 250 different jobs turned.



These Men Can Help You

Let our engineers assist you in the selection of the proper automatic lathe for your job, and make tooling suggestions for faster turning of both short and long-run work. This competent staff of engineers is available to study your problems and suggest changes for increased production, lower costs. Send complete, accurate information with each inquiry.

How to Turn Short-Run Work Faster

is illustrated in this booklet describing features of Sundstrand Automatic Lathes. Quick set-up and easy change-over features are described in detail. Write for yours today. Ask for Bulletin No. 817.

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

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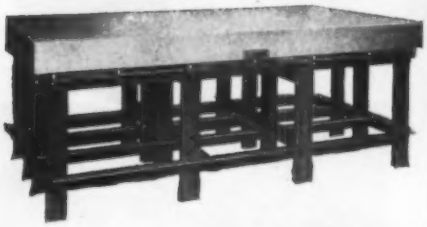

... use CHALLENGE Semi-Steel LAYOUT SURFACE PLATES

● Highly recommended for use where a true, rigid, smooth surface is required for layout, inspection or assembly. Planer finish—dependable and accurate. Sold with or without reinforced all-steel stand—arc-welded to give the strength and solidity of one-piece construction. Stand is provided with lock leveling screws which enable user to level the plate quickly and lock it securely. Plates are made in 8 standard sizes, up to 54x144 inches, all six inches thick. Special sizes, including extra large, made to order.

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● Specially designed to assure a perfect fit when lapping metal-to-metal joints on which no sealer is used. Made of special analysis semi-steel, carefully machined. Grooves are 1/16-inch, 1/2-inch apart, running full length and width of the surface. Plates are available with or without all-steel, arc-welded stand equipped with lock leveling screws. Many sizes.

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THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICH., U.S.A.
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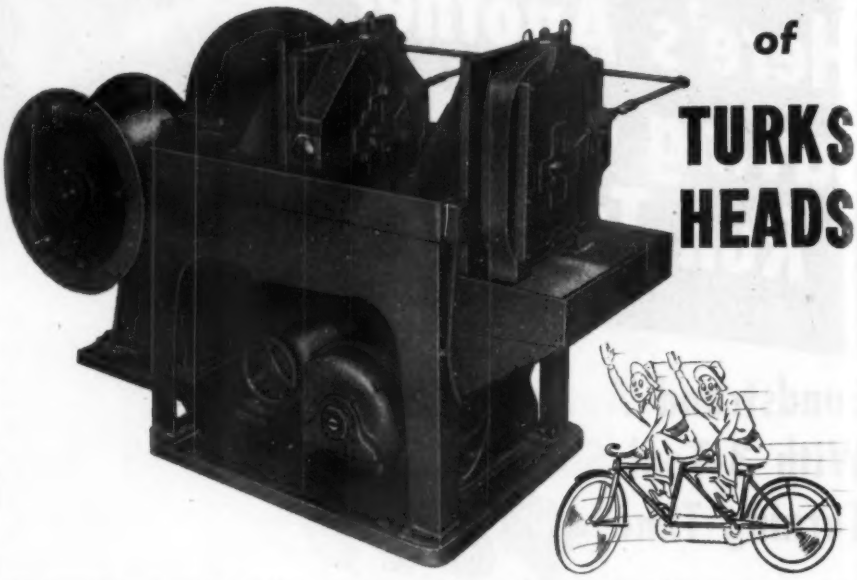

for breakdown and finishing operations in one draw at variable speeds to 140 feet per minute.
Wire capacities from 1/8" to 1" drawn to specified shapes.
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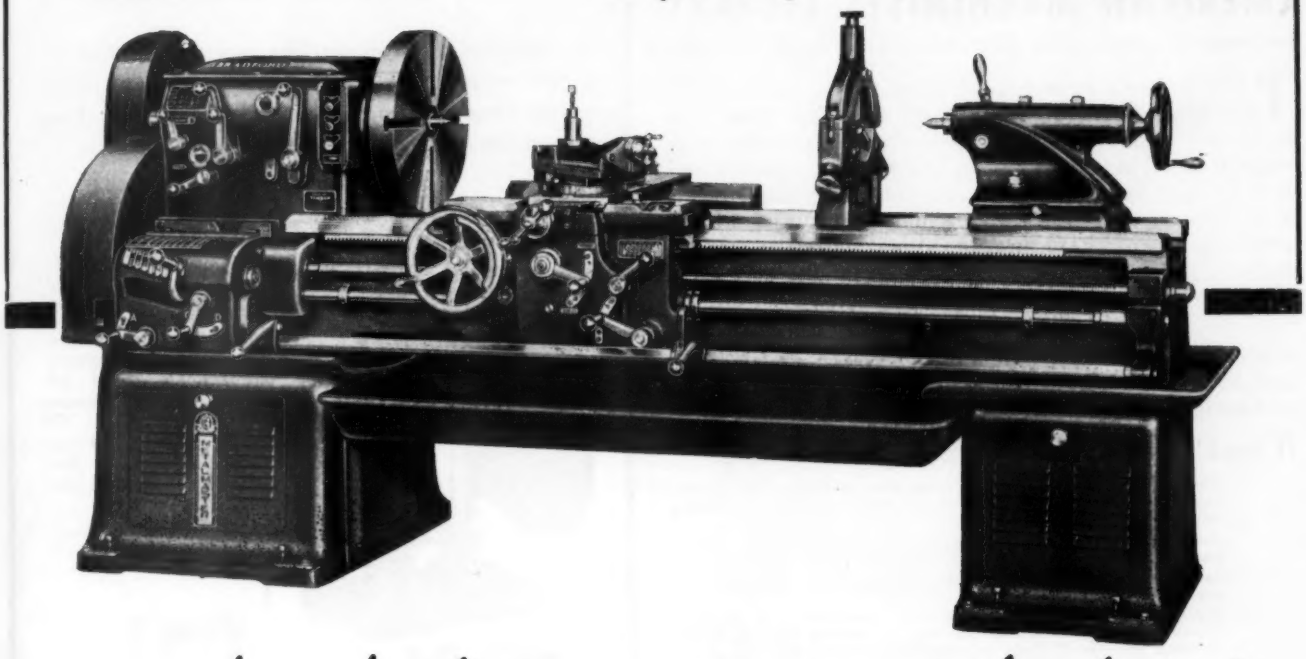
Metalmaster

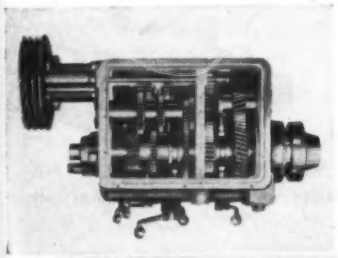
12", 14", and 16" LATHES



. . . for fast, precision production!

For production plus . . . for economy and ease of operation . . . look to the METALMASTER! Every point of design and construction insures superior performance.

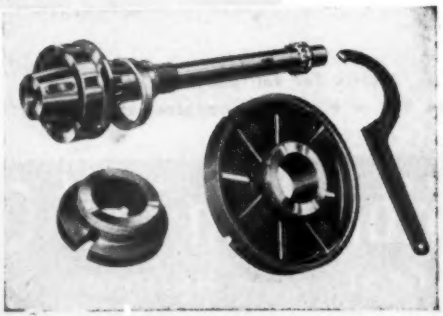
Here are three features which help to make the METALMASTER a leader in its field.



HEADSTOCK — Heavy walls, sturdy center bracing, twelve spindle speeds, (both forward and reverse), alloy steel gears.

SPINDLE — Machined from solid high-carbon molybdenum steel forgings, bored straight through from end to end — large, precision-tapered roller bearings.

SMOOTH, POWERFUL DRIVE — Multiple "V" belts insure quiet, efficient power delivery. Multiple disc clutch operates completely oil-immersed. Jogging, with motor running at high speed, is entirely possible. Drive sheave is mounted on precision-tapered roller bearings.



Solve those knotty production problems with the METALMASTER! Write — we'll furnish catalogs explaining the METALMASTER in detail.

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—practical information on grinding machines and abrasive wheels, showing what they do, how to operate them, and how to make best use of them on various types of work

—training in the various operations performed in drilling and surfacing materials in the machine shop

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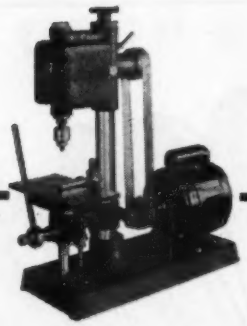

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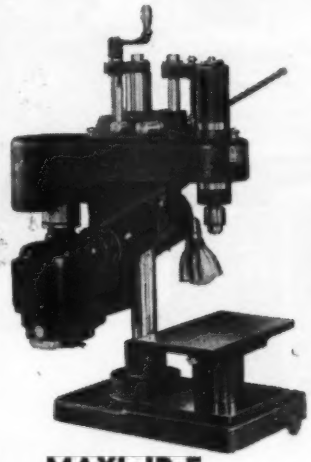
A high production sturdy little machine particularly suited to precision tapping of light work—instruments, cameras, watches, clocks and the like. Easy to operate—can be attached to any light socket.



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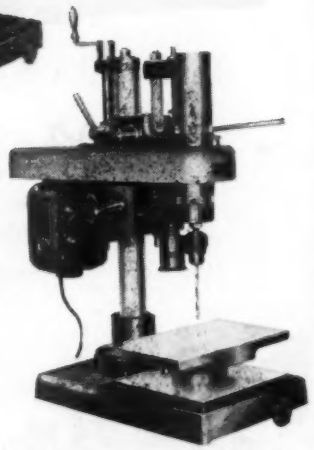

The "Varimatic" and the Maxi-Jr.-E each feature a full floating spindle of special design which eliminates radial belt pull on the spindle.

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Write for full particulars on any or all of the machines shown.

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830 NINTH ST HAMILTON, OHIO

GRINDING INSTEAD OF SCRAPING REDUCED MAN HOURS 75%

The policy of "grinding instead of hand scraping wherever possible" has resulted in a 75% saving of man hours for a prominent Detroit Manufacturer. Because of this saving, 80 out of 125 employees in the Scraping Department were released for important service elsewhere in the plant. This is mighty important now when every minute, every hour and every man counts.

Jobs are being routed through these Mattison Grinders that were previously thought impossible to grind. Special fixtures permit the handling of jobs, such as shown in close-up views, at a considerable time saving. Parts with angular or hardened steel ways are also ground to closest accuracy and fine finish.

Grinding, instead of scraping, means time saved and faster production, which in turn, results in a saving of man hours. This is a mighty important point that warrants your careful consideration. Write for complete details on the Mattison High-Powered Precision Surface Grinder and free set-up book showing further examples of the capabilities of this machine.

SET-UP SHEETS

Containing complete information regarding these and similar jobs will be sent upon request.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

IF YOU'RE LOOKING FOR

TRULY HIGH PRODUCTION

investigate this

PORTER-McLEOD COLD METAL SAWING MACHINE

Your problem of relieving bottlenecks in cutting-off operations and keeping production moving at top speed can be solved by this 8" powerful, convenient Porter-McLeod machine.

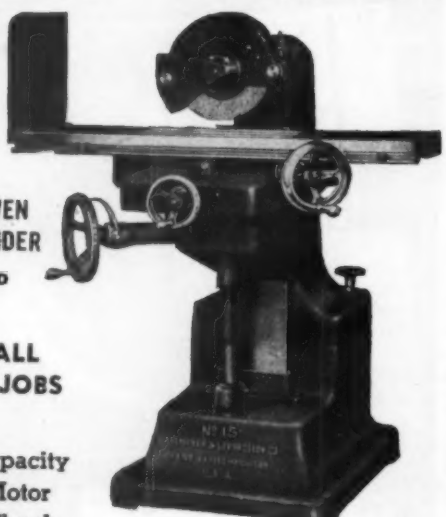
With a capacity for cutting 8" round or 7½" square stock and arranged so that stock can be nested for multiple cuts together with a standard feed of 3" per minute, a wide variety of work can be cut on a high production basis.

Speed with safety and accuracy is assured by pulling the blade upward through cut, with blade supported close to its rim to eliminate the possibility of buckling and weaving. A friction disc feed insures against blade damage and breakage. Blade design is such that every tooth cuts.

Get all facts today concerning this fast, accurate, straight-cutting machine. Write for Illustrated, Descriptive Bulletin.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.

GRAND RAPIDS



No. 15
MOTOR DRIVEN
SURFACE GRINDER
HAND FEED

•

FOR SMALL
DELICATE JOBS

6 x 18" Capacity
1½ H.P. Motor
10 x 1" Wheel

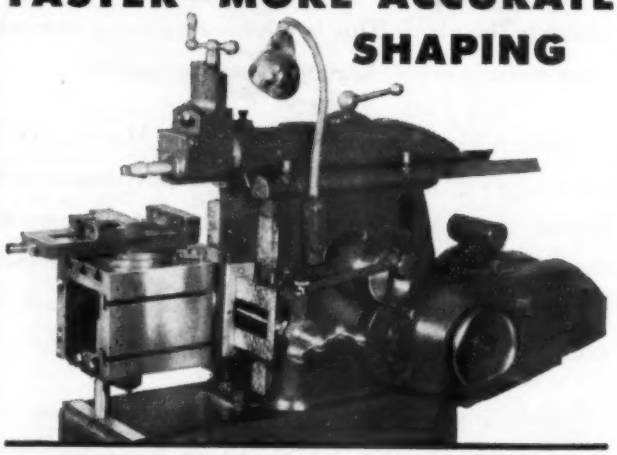
Reasonably Prompt Delivery

Many manufacturers on war work are using large batteries of these grinders.

•

GALLMEYER & LIVINGSTON CO.
330 Straight Ave. S. W.
GRAND RAPIDS MICHIGAN

FASTER-MORE ACCURATE SHAPING



WITH *SHAPE-RITE* SHAPERS

Get these advantages at ⅓ less cost!
1. ACCURACY
2. SPEED
3. SMOOTHNESS
4. EASE OF USE
5. FLEXIBILITY

Regardless of speed or size of cut, this 8"-stroke shaper has no equal in performance. All working surfaces are precision-ground and hand-scraped to master gauges and all moving parts are fitted to closest tolerances to guarantee accurate work.

Extra-heavy ram and long ram-ways, plus helical-cut and precision-lapped gears help the Shape-Rite to give you the finest possible finish on all types of work—at *low* cost.

Sales Service MACHINE TOOL Company
2426 University Avenue • • • Saint Paul 4, Minnesota

WRITE TODAY for BULLETIN "C"
Gives new features, specifications, prices.

HERE'S THE *Speed*

"LET'S GET ON WITH THE WAR"

Common sense dictates relentless pursuit of the war effort. The iron is hot . . . it must not cool off. Industry can help enormously to bring a quicker and less costly victory if overconfidence is not allowed to bog down production.

Speed is the answer . . . continuing speed.

DRILLING, MILLING, TAPPING, SCREW INSERTING *Simultaneously*

The BODINE is a fast machine. It gangs production tools for repetitive production of small armament components, accurately and continuously.

The Bodine basic principle, combining a series of drilling, milling, tapping and screw inserting operations in *one* machine . . . and providing extreme flexibility in locating multiple spindles around an automatic indexing dial, saves power, maintenance, floor space and man-hours.

Moreover, semi-skilled operators, especially women, can easily handle production at low fatigue factor. Electrical interlocks prevent damage to machine and tools, protect operator.

Parts are placed in position on the dial which carries them to progressive stations where tools located vertically, horizontally or inverted perform their different operations. Ejection may be manual or automatic, depending upon the nature of the part.

There are six standard sizes of Bodine machines . . . all of which may be adapted to a great variety of tooling set-ups. The smaller size, No. 40-10 requires but 54" x 60" floor space, the largest, No. 48-30, only 90" x 96". They accommodate from 6 to 8 spindles with capacities ranging from ¼" to ½" dia., with vertical stroke from $\frac{13}{16}$" to 3½ in depth.

TYPICAL OPERATIONS

This special (Bodine patented) set-up is for rapid production of accurately located holes in a delicate ordnance component. Operations: 7 holes drilled (.5mm to 2.8mm dia.) with tolerance for center distance .0004". By changing the dial and relocating spindles many different set-ups can be made on a single machine.

Ask Bodine engineers for better, faster methods. Bulletin on request.

THE
Bodine
CORPORATION
BRIDGEPORT CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

"Blount" The NEW MODEL K

BUFFER and POLISHER

Speeds production through easy handling

This new Blount contribution provides offset wheel shafts and overhang toward operator, making it easy to work at. Plenty of room is available for swinging work to be polished. Fewer parts requiring attention assure easy operation; ample foot room reduces fatigue by enabling operator to stand erect at his work; streamlining simplifies cleaning.

Other features include:

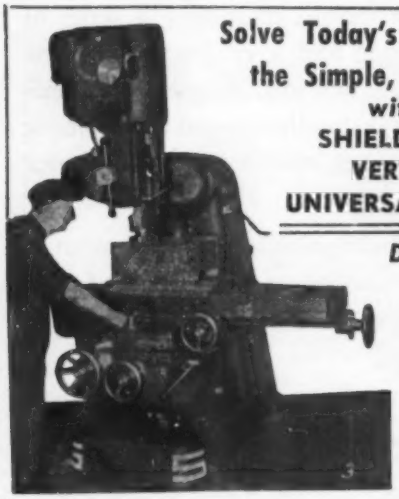
. . . heavy rigid, smooth base construction.
. . . motor mounted in air-flow base; special enclosed or drip-proof motors not required.
. . . easily accessible and adjustable V-belt drive completely enclosed for maximum safety within column.
. . . spindle lock for holding spindle when changing wheels.
. . . positive grease-sealed bearing assemblies.

COMPLETE DETAILS AVAILABLE ON REQUEST

CONDENSED SPECIFICATIONS . . .

Height floor to spindle center—38"
Spindle length overall—53"
Spindle extension, each side—10¾" (optional)
Spindle bearings—Simplex "Cartridge-Type"
Spindle revolutions (optional)
Motors—2, 3 and 5 H.P.
Base 28" x 24"

J. G. BLOUNT COMPANY Everett, Mass., U.S.A.



Solve Today's Tough Problems the Simple, Accurate Way *with the* SHIELDS NO. 3 VERTICAL UNIVERSAL MILLER

Delivery 4 Weeks

•

Intricate milling, boring and drilling operations which by conventional machines would require multiple set-up and special fixtures, can be handled quickly, conveniently and accurately on the SHIELDS in a single set-up of the work and without costly fixtures.

Unique and exclusive features include:

. . . adjustable head which can be tilted to any compound angle, making possible universal milling with dividing head and centers without swinging table.

. . . power down feed incorporated in head, making possible drilling and boring at compound angles in different faces of work at one set-up.

. . . 7" spindle travel and speeds from 35 to 1128 R.P.M. provide versatility for a wide range of work.

CONDENSED SPECIFICATIONS

Table Working Surface—64" x 16". Longitudinal Power Travel—34". Cross Power Travel—14". Vertical Power Travel—17½".

Special Machinery Designed and Built
Write for complete detailed specifications

SHIELDS MANUFACTURING CO., Inc.
Long Island City, N. Y.

ROCKFORD MACHINE TOOL CO.

Hy-Draulic

Shapers . . Planers . . Slotters . . Shaper-Planers
—ROCKFORD, ILLINOIS, U. S. A.—

BARNESDRIL

HONERS . . . DRILLERS

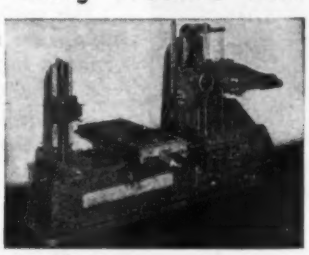
Write Today for Catalog A

BARNES DRILL CO.

830 CHESTNUT STREET ROCKFORD, ILLINOIS

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

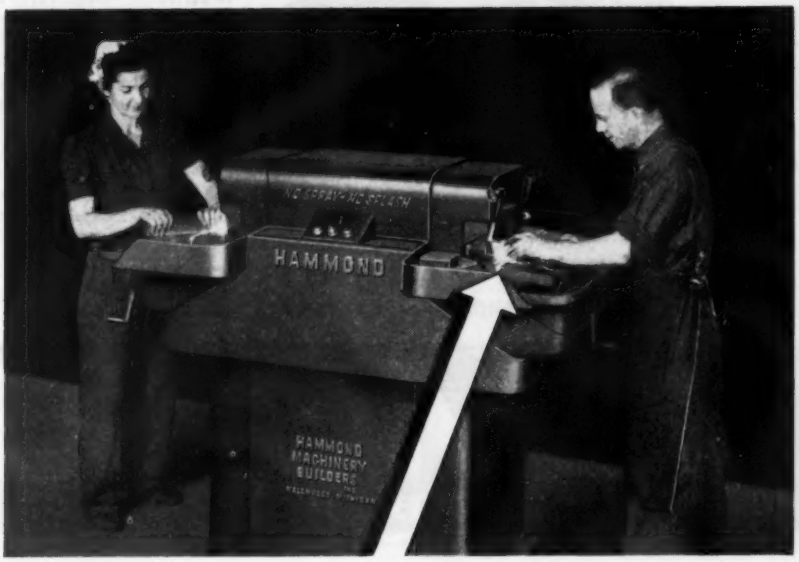
Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

NEW Hammond 10" and 14" CARBIDE TOOL GRINDERS



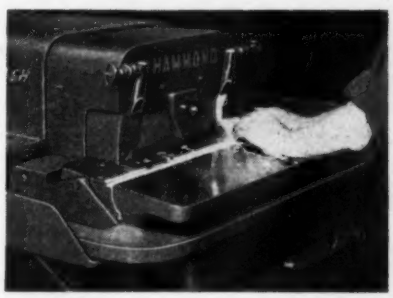
An Improved Wet Grinding Method

"You're Dry when you grind Wet!"

NO SPRAY
NO SPLASH

HAMMOND FEATURES

(1) Large Wheels for faster Carbide Tool Grinding
(2) No Spray—No Splash Guards
(3) Full Visibility of the Work
(4) Greater Operator Freedom
(5) Safety Cup Wheel Discs
(6) Fully adjustable Coolant Spouts



For faster carbide tool grinding! Grind carbide tipped tools . . . and high speed, too . . . by the wet grinding method, also use large 10" or 14" wheels, to prevent overheating of the tool which may ruin it by crazing, flaking or cracking. "Tools are Weapons—Treat 'em Right!" Keep 'em sharp on a HAMMOND 10" or 14" No Spray—No Splash Carbide Wet Grinder.

WRITE FOR BULLETIN 206

Hammond Machinery Builders Inc.
1618 DOUGLAS AVE. • KALAMAZOO 54, MICH.
EASTERN BRANCH—71 West 23rd St., New York, 10, N. Y.

OTHER HAMMOND CARBIDE TOOL GRINDERS
for complete Carbide Tool Maintenance

HAMMOND TYPE 4
For grinding CHIP BREAKER and Diamond Wheel Finishing

Multi-V-belt drive Model 4-B Combination Chipbreaker and cup wheel grinder permits use of ½ HP motor with any electrical specification. Machine equipped with unique any angle tool vise and accommodates up to 6" wheels on right side of machine for chipbreaker grinding—6" diamond cup wheel on left side for diamond wheel finishing.

HAMMOND TYPE 10A
For 10" Wheels—Dry Grinding

Heavy design and construction—for fast, large volume grinding. Dry operating — has Multi-V-belt drive permitting use of any standard motor in the base.

Write for Complete Information.

Hammond OF KALAMAZOO

SIMMONS
No. 2 TURRET LATHE

- MICRO-SPEED DRIVE
- SELECTOR DIAL CONTROL
- SPINDLE BRAKE and CLUTCH

SPECIFICATIONS

Bar Capacity—1¼"; Swing over bed—14"; Swing over cross-slide—8". Made in Plain and Back-geared types (latter shown in illustration).

This is the type of report we receive regularly on the performance of the Simmons No. 2 Turret Lathe.

Writes Cessna Aircraft Company:

"We are using the Simmons Micro-Speed Turret Lathe and find it very satisfactory. In these days of full-out aircraft production, modern tooling is essential."

Writes Swift Lubricator Company:

"Stop and consider that these machines are being used to make bushings for a prominent aircraft concern. The material is x4130 steel, heat-treated to 150,000 tensile. We have turned out thousands of these parts, holding the outside diameter to .0005 tolerance, using only a stock model roll tool. These parts are reamed to a .001 tolerance and held to a length within .005".

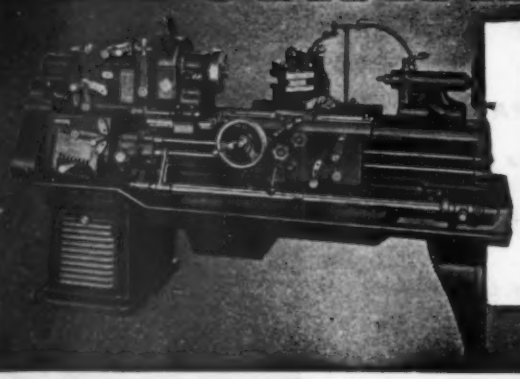
Besides this assurance of high precision, the other "plus" factors not to be overlooked are low cost and quick deliveries to high priority holders. Write TODAY for complete details.

SIMMONS MACHINE TOOL CORPORATION

Main Office: 1759 N. BROADWAY, ALBANY 1, N. Y., *New York Office:* 149 BROADWAY

SIMMONS

LATHES · TURRET LATHES · MILLERS · PLANERS · 6" BAR BORING MACHINES



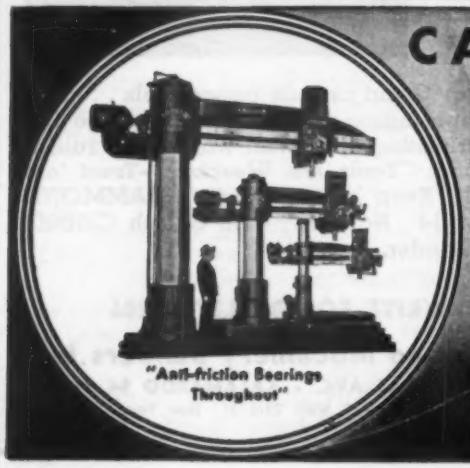
CINCINNATI LATHES

Precision—on High Speed, Heavy Duty Machining

Load up Cincinnati Lathes to their full capacity—take heaviest cuts at highest speeds . . . their rugged construction guarantees constant precision! Produced in 14" to 30" sizes, with 12 or 24 speeds and 32 to 96 feeds, they are designed throughout to handle the toughest jobs. Write for latest complete catalog.

THE CINCINNATI LATHE & TOOL CO.

Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio



CARLTON RADIAL DRILL

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The
CARLTON
MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

This letter will interest YOU!

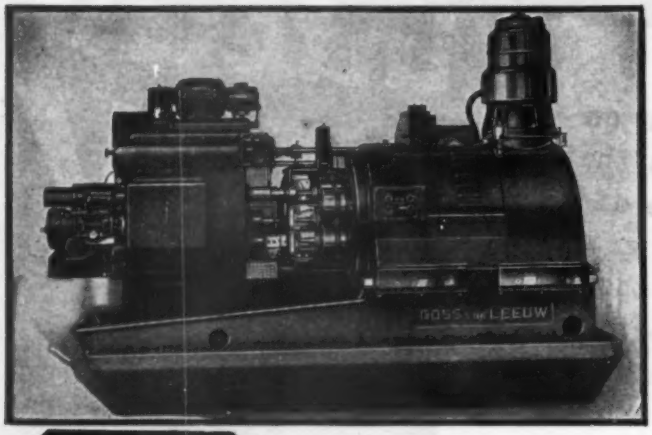
"Regarding the type of work done on this grinder, we wish to advise that we are using it for a multitude of purposes. The main usage is in grinding the steam-tight joints on the lower and upper halves of turbine cases. This joint is a precision joint and must be ground accurately to assure steam tightness. We also use the grinder for the grinding of covering plates for oil reservoirs and other places where a smooth precision joint is needed to assure a gas or liquid tightness."

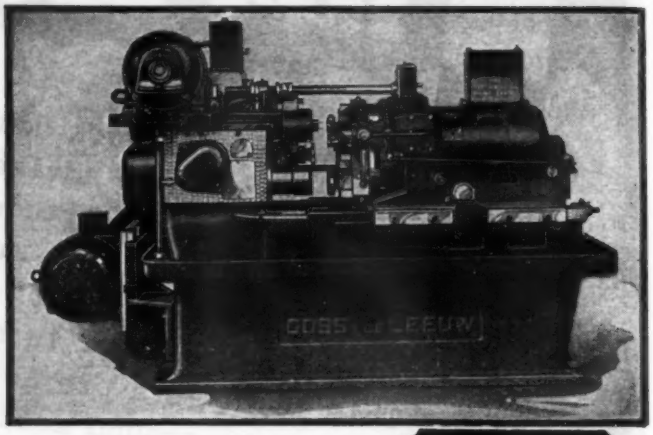
HILL Hydraulic Surface Grinders are built in both Horizontal Spindle and Vertical Spindle types in a full range of sizes with table dimensions 18", 24", 30", 36", and wider — and 5 to 20 feet long.

The HILL ACME CO.

6400 BREAKWATER AVE. CLEVELAND, OHIO

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

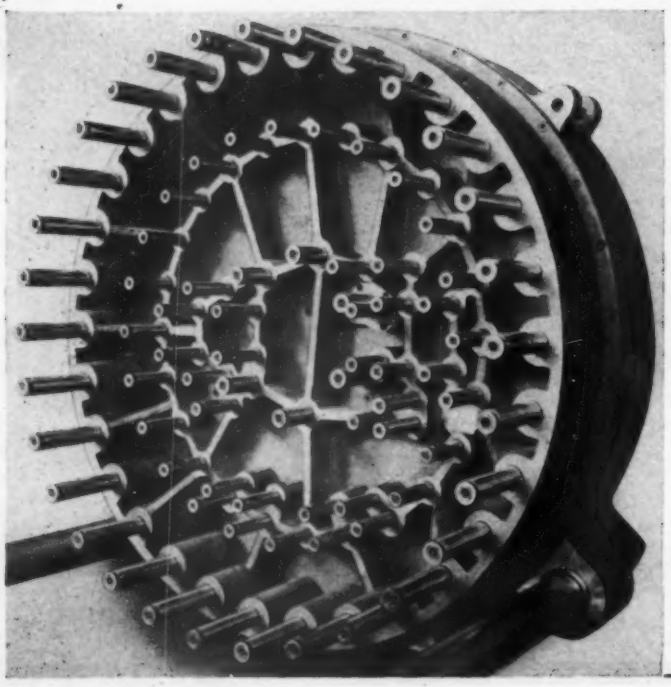
TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

Buhr

MULTIPLE SPINDLE DRILL HEADS

are engineered, designed and built by men of long experience in this field



A TYPICAL EXAMPLE IS THIS 82 SPINDLE BUHR HORIZONTAL DRILL HEAD . . . *for drilling*

32 - .257
14 - 5/16
36 - 17/32 dia. holes.

This is the right hand head of a 2-way Hydraulic Horizontal Machine.

All spindles and gears are of alloy steel heat treated and ground, ball bearings are used throughout and an oil pump keeps them in a bath of oil. Vertical adjustment is provided in all spindles to compensate for unequal drill lengths and to adjust drills to proper depth.

BUHR MACHINE TOOL COMPANY
Green and Davis
ANN ARBOR MICH.

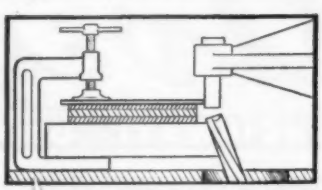
Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment.

A NONFERROUS Metal Working Machine

★

To Mill Constant or Varying Bevels . . . . . and to Profile or Trim

On this Onsrud machine, the cutter spindle tilts forward or backward and may be set to make any angle with the table up to 20° off-vertical. The cutter is directly driven by a 10,800 RPM high cycle electric motor. Thus the A-69 Tilting Spindle Shaper makes easy and fast the work of accurately beveling nonferrous materials. Setup is simple and templates or patterns used in conjunction with the tilting spindle shaper solve many production problems.



The relation between the work and the cutter, guide pin and pattern is schematically illustrated here. The cutter is set at an angle to produce the bevel desired. The A-69 eliminates the need for special cutters or complex fixtures to produce any bevel within the range of the spindle's tilt.

Trimming and profiling are other operations to which the A-69 is particularly well adapted.

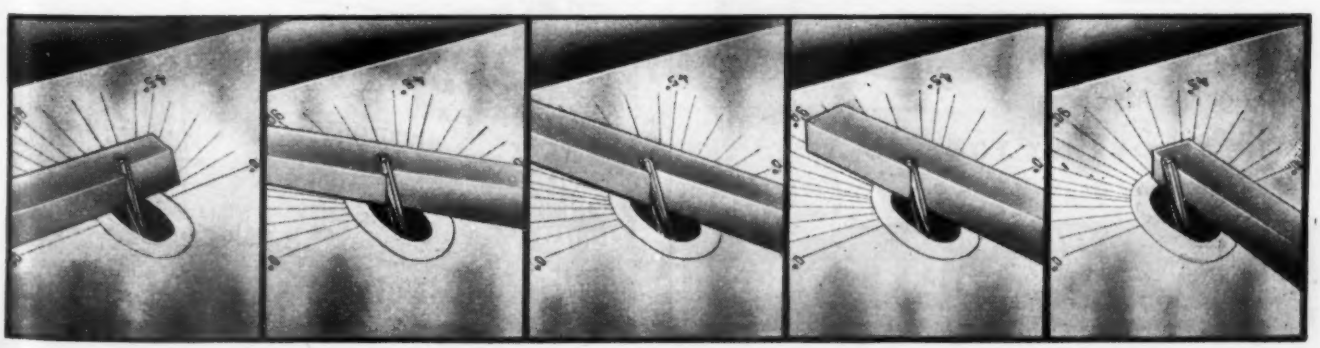
Bevel angle may be varied without changing the spindle angle by simply changing the angle of approach at which work is fed. With this "sweep" technique it is relatively easy to produce varying bevels on work.

Your copy of a free bulletin describing this unique, versatile machine will be sent on request. Write today.

ONSRUD MACHINE WORKS, Inc.
3921 Palmer Street, Chicago 47, Illinois
Sales Offices in all Principal Cities

The illustration below shows how "sweeping" the work around the tilted spindle during feed produces a varying bevel. Note that the spindle angle remains unchanged—bevel variation is produced by change in angle at which work is fed.

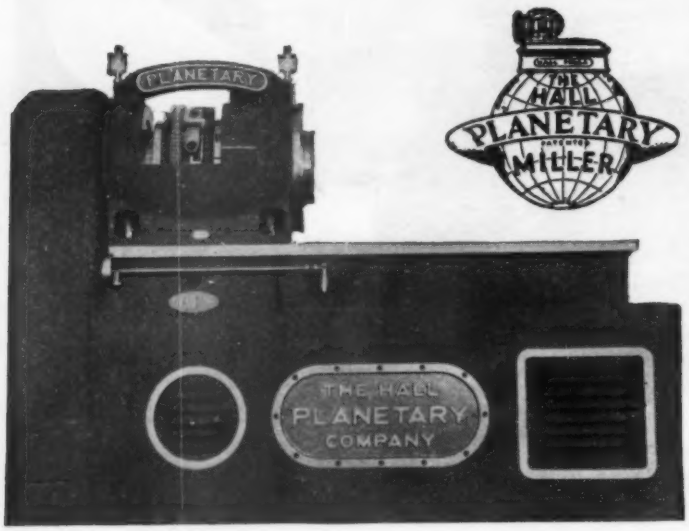
Patent No. 1-991-623 469-158

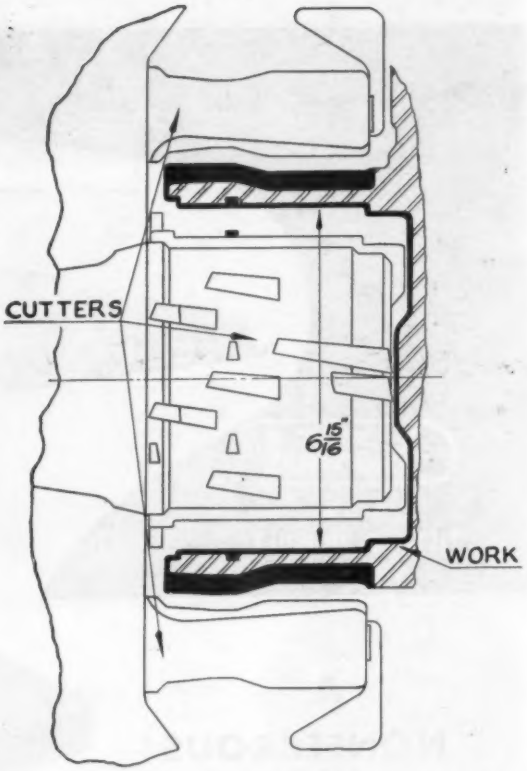


Production

Propeller Hub Arms—15 minutes each, rough or finish operations. Internal and external simultaneously. Accuracy well within requirements.

Send us your prints.





Send us prints for details

THE HALL PLANETARY COMPANY

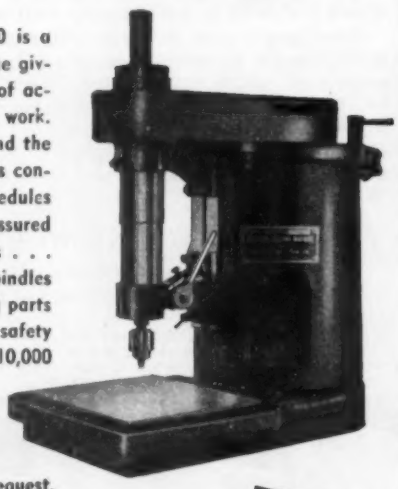
Fox Street and Abbotsford Avenue

PHILADELPHIA, PA.

SIGOURNEY M-100

FOR CRITICAL DRILLING

• The Sigourney M-100 is a precision drilling machine giving the highest degree of accuracy in fine tolerance work. Heavily built to withstand the wear and tear of today's continuous production schedules . . . smooth operation assured by sealed ball bearings . . . hardened and ground spindles for long life . . . moving parts enclosed for maximum safety . . . speeds 4,000 to 10,000 R.P.M. . . . available in 1, 2, 3 and 4 spindle models.



Detailed Bulletin on request.

THE SIGOURNEY TOOL CO.

9 Sigourney St., Hartford 5, Conn.

Sole Sales Agents

PRATT & WHITNEY

Division Niles-Bement-Pond Co. West Hartford, Connecticut

LELAND-GIFFORD COMPANY · WORCESTER MASS. U.S.A. · MACHINE TOOLS · CRANK SHAFTS

Drilling and Tapping Machines

(Automatic and Semi-Automatic)

LELAND GIFFORD CO.

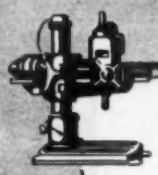
WORCESTER, MASS.

Sensitive DRILLING MACHINES

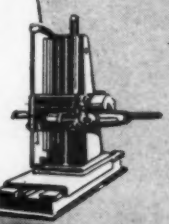
Avey

CINCINNATI OHIO

GILBERT



PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.

CINCINNATI, OHIO

GEOMETRIC

Pointers

FOR SAVING HIGH SPEED STEEL

No. 10
USE CORRECT SPEEDS AND FEEDS

Material	Surface Speed (F.P.M.) For T.P.I.			
	3-7½	8-15	16-24	25 & Up
Chrome Ni-Chrome Nickel Stainless-Steels, etc.	8	10	15	20
Wrought Iron Steels— SAE No. 1040 SAE No. T1330	15	20	25	30
C. R. Steel Bess. Scr. Stock, etc.	20	30	40	50
Brass Forgings Naval Bronze	25	40	50	80
Brass Stamping Tubing	40	80	100	150
Aluminum Bar Brass Cast Brass	50	100	150	200

T.P.I.=threads per inch

SPEEDS FOR THREADING
FOR HIGH SPEED STEEL CHASERS

This table shows the recommended surface speeds (in feet per minute) for various materials, given threads per inch. A more complete chart containing also a conversion table into R.P.M. will be sent you FREE and without obligation. Printed on heavy cardboard, 8¼" x 11". A real help in getting the most and best out of your chasers!

To save that precious high speed steel in your chasers— don't burn it up under excessive speeds!

When cutting screw threads, bear this in mind:—In proportion to the size of its cutting edges, a threading tool is forced to remove more stock in a single cut than any other metal-cutting tool used. In the case of a drill, a milling cutter, a boring tool and the like, feed per revolution can be established and controlled; but the feed of a threading tool is controlled by the pitch. Thus, for example, if the job calls for 8 threads per inch, 1/8" advance is required per revolution.

If you run your chasers at conservative surface speeds, resharpen them frequently before they become dull, resharpen them accurately, grinding all chasers equally—and then compare the total threads cut with what you would produce at excessive speeds with burned and deformed chaser teeth—you'll find that "doing it right" pays big dividends in better output and longer-lived tools.

The chart at the left shows proper speeds for only a few of the materials you may be threading. A **complete** chart, giving recommended surface speeds in feet per minute for all principal metals and other materials, as well as a conversion table into R.P.M., will be gladly sent on request. The Geometric Tool Company, New Haven 15, Connecticut.

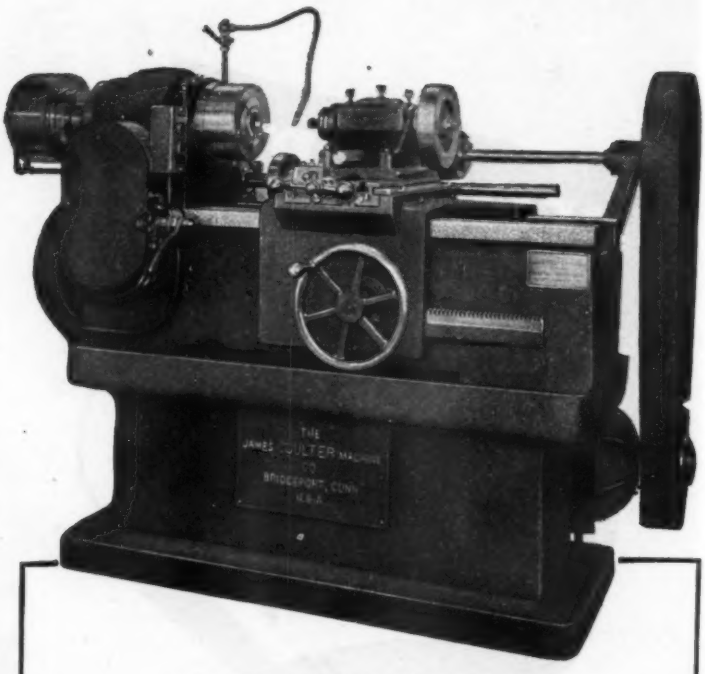
The Geometric Tool Company is listed on the Treasury Department's Roll of Honor of those companies whose employees contribute at least 10 percent of their earnings, through the Payroll Savings Plan, for War Bonds. Buy War Bonds and Stamps each payday and help bring V-Day closer!

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

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BRIDGEPORT • CONNECTICUT • U.S.A.

AMEs *Precision*
BENCH MILLING MACHINE

For most accurate toolroom and production milling. Large in size and capacity. Cutter head and indexing head take same 1" capacity collet. Separate headstock for vertical milling. Motor and jackshaft-drive.

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Swiveling ram head and tool holder, automatic circular table and independent automatic feeds in all directions.
7" TO 10" STROKE
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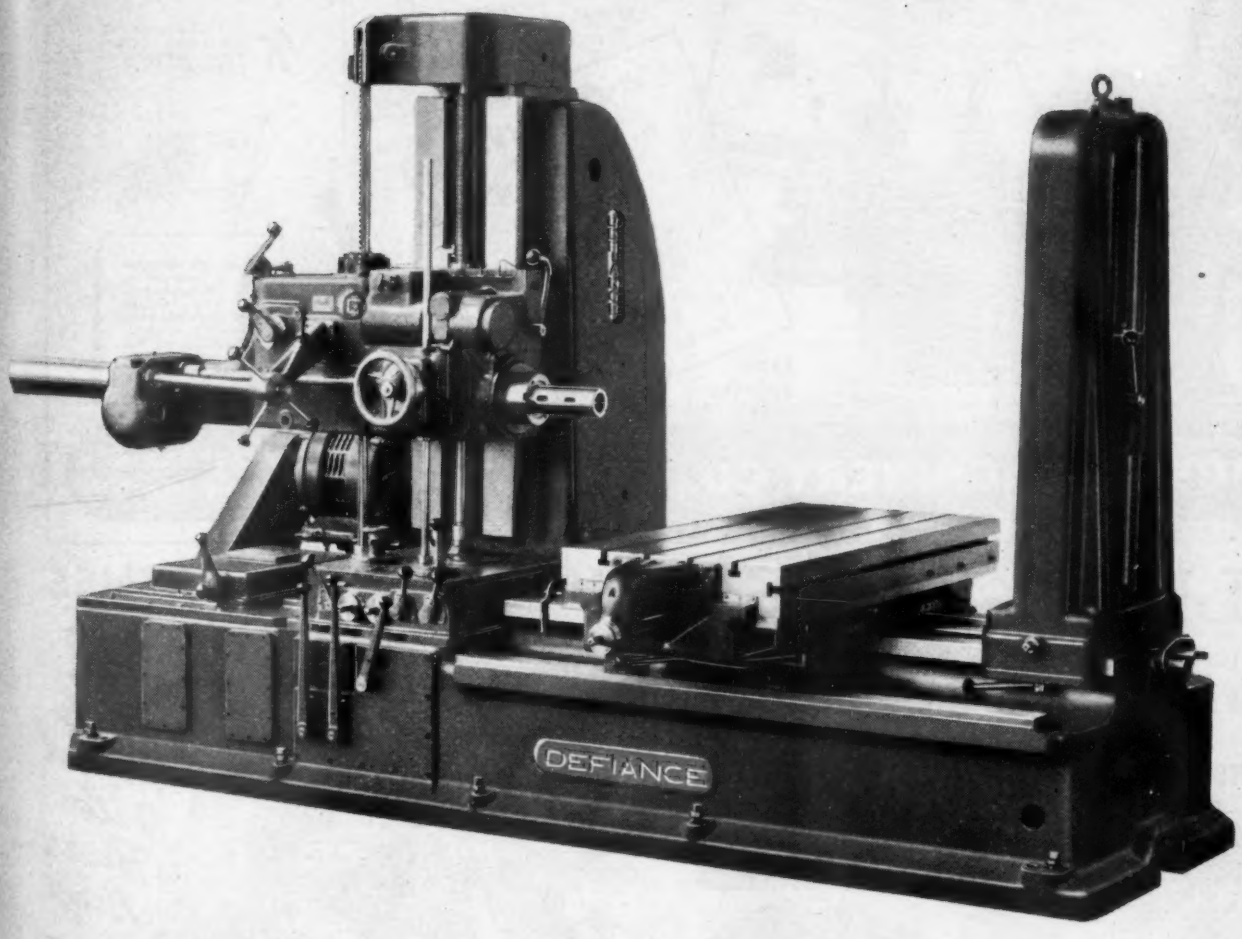


DEFIANCE stands for Accuracy... appreciated today more than ever on America's "production front"... where Defiance Mills are helping plants beat tough production schedules with *speed* and *accuracy*.

Defiance Machine Works, Inc., Defiance, Ohio

Makers of Precision Machinery Since 1850

MOREY TURRET LATHES

for BAR or CHUCKING { UNIVERSAL or PLAIN

#3 UNIVERSAL

For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

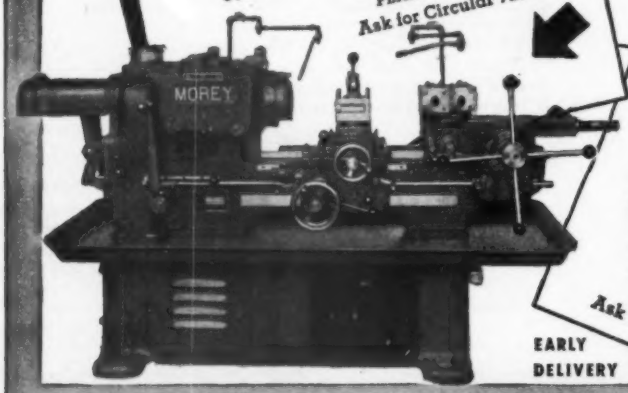
#2 PLAIN-GEARED

For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY



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DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).

GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.

SPINDLE MOUNTED ON TIMKEN BEARINGS.

RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS MODERN TOOLS WILL WITHSTAND.

SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

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2 LINELY

FEATURES THAT INSURE
Speed and Precision
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MILLING AND JIG BORING

For FAST SET UP ON SMALL WORK, this vertical LINLEY is invaluable to busy tool rooms for die work, jig, metal pattern and model making, for drilling, reaming and varied shop work. Micrometer setting eliminates pencil figuring . . . prevents errors. Compact, sturdy construction . . . minimum floor space required. Serves and saves on jobs often scheduled for larger machines. *Illustrated bulletin on request.*

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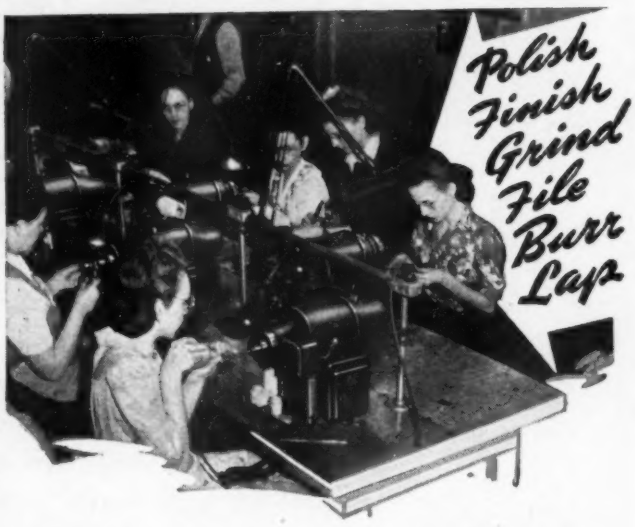

- **Meet stepped-up production schedules by employing SCHAUER SPEED LATHES for the final finishing operations on small metal and plastic parts.**
- **Speed, accuracy, continuous, trouble-free operation make SCHAUER SPEED LATHES production necessities in every plant. A size and type for every purpose. Write for Catalog 420.**

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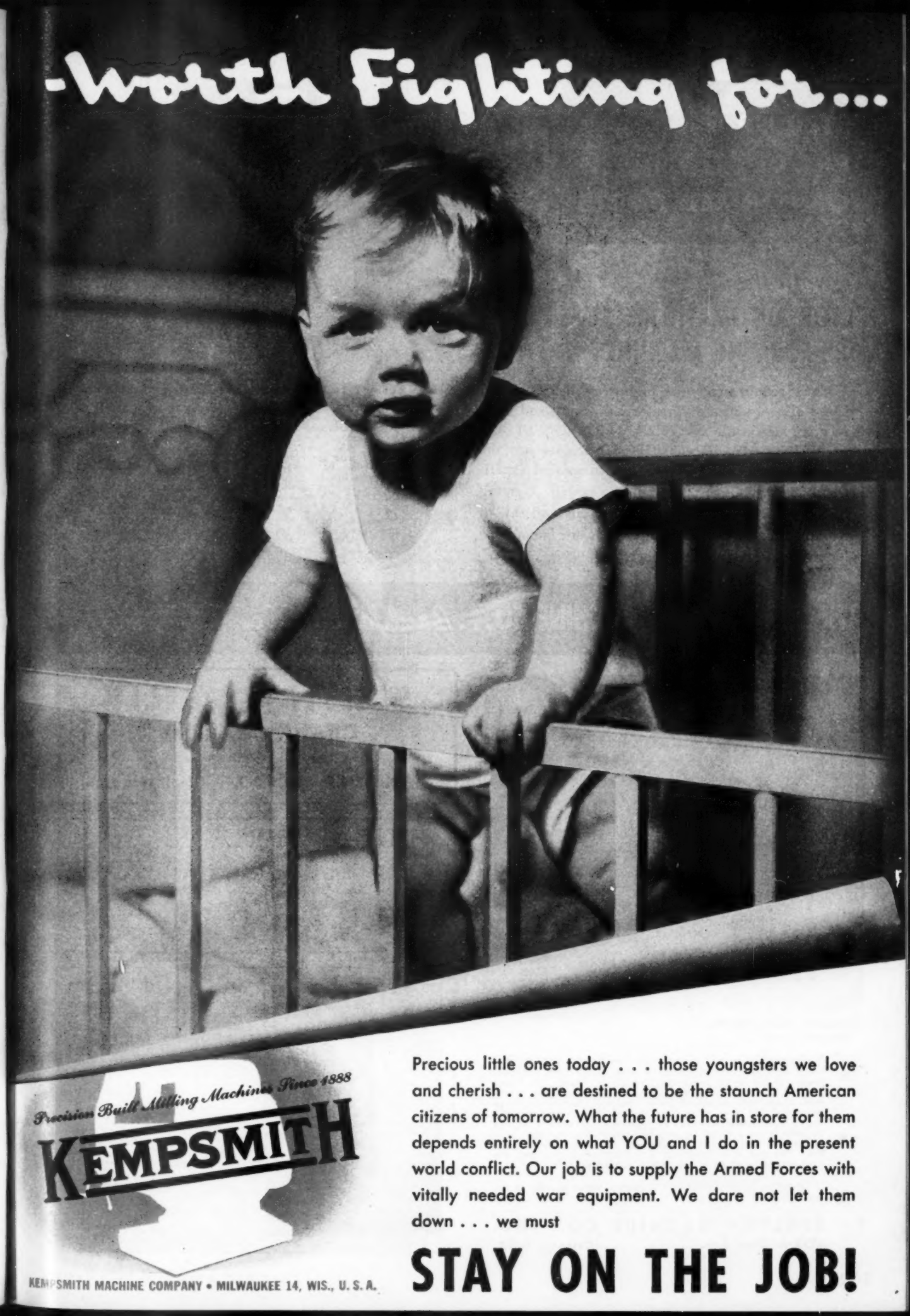
SCHAUER MACHINE COMPANY
"Originators of Today's Speed Lathes"
2067 Reading Road • Cincinnati, Ohio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Precision Built Milling Machines Since 1888
KEMPSMITH
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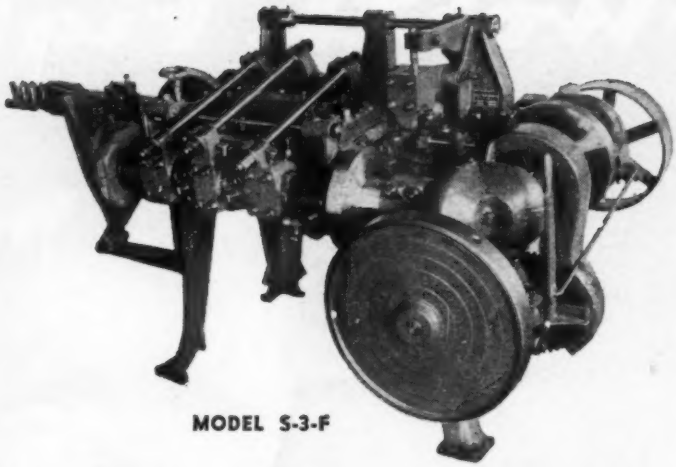
Precious little ones today . . . those youngsters we love and cherish . . . are destined to be the staunch American citizens of tomorrow. What the future has in store for them depends entirely on what YOU and I do in the present world conflict. Our job is to supply the Armed Forces with vitally needed war equipment. We dare not let them down . . . we must
STAY ON THE JOB!

STEP UP PRODUCTION OF FORMED PARTS

. . . with the

NILSON AUTOMATIC METAL and WIRE FORMING MACHINES



MODEL S-3-F

Today's requirements for higher efficiency, greater speed and products of greater uniformity and accuracy are met in the new NILSON RIBBON STOCK FORMING MACHINES. These machines are the achievement of over fifty years accumulated experience in designing and building metal forming machines. Careful selection of materials and skilled workmanship result in machines that are famous for long life and low maintenance.

FEATURES THAT CONTRIBUTE TO BETTER, FASTER WORK

Superior features of the NILSON four-slide forming machines are the result of long experience and include:

. . . open construction of press and forming tools.
. . . patented slide feed which has an independent cam-operated wire gripping device.
. . . transmission of power operating wire feed through a straight line.

Send for 4-page circular giving further information as well as detailed specifications of sizes and capacities.

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We have been engaged in the design and production of special automatic machinery of high production capacity for over thirty years. We are prepared to render a complete service in connection with the design and production of automatic machinery of every description. Consult Nilson on your requirements.

THE A. H. NILSON MACHINE CO. . . . *Bridgeport, Conn., U.S.A.*

SHELDON BBU-1240 WQ
Precision Lathe

★ This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, underneath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a *standard* 1-piece bed. This bed is bridge-braced with heavy cross girts and has hand scraped ways—2 V-ways and 2 flat ways.

★ If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

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CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

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Horizontal Boring, Drilling and Milling Machine
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It is a time, labor and money saver on innumerable jobs in any shop. Sharpens tools, cutters, etc., of many kinds.

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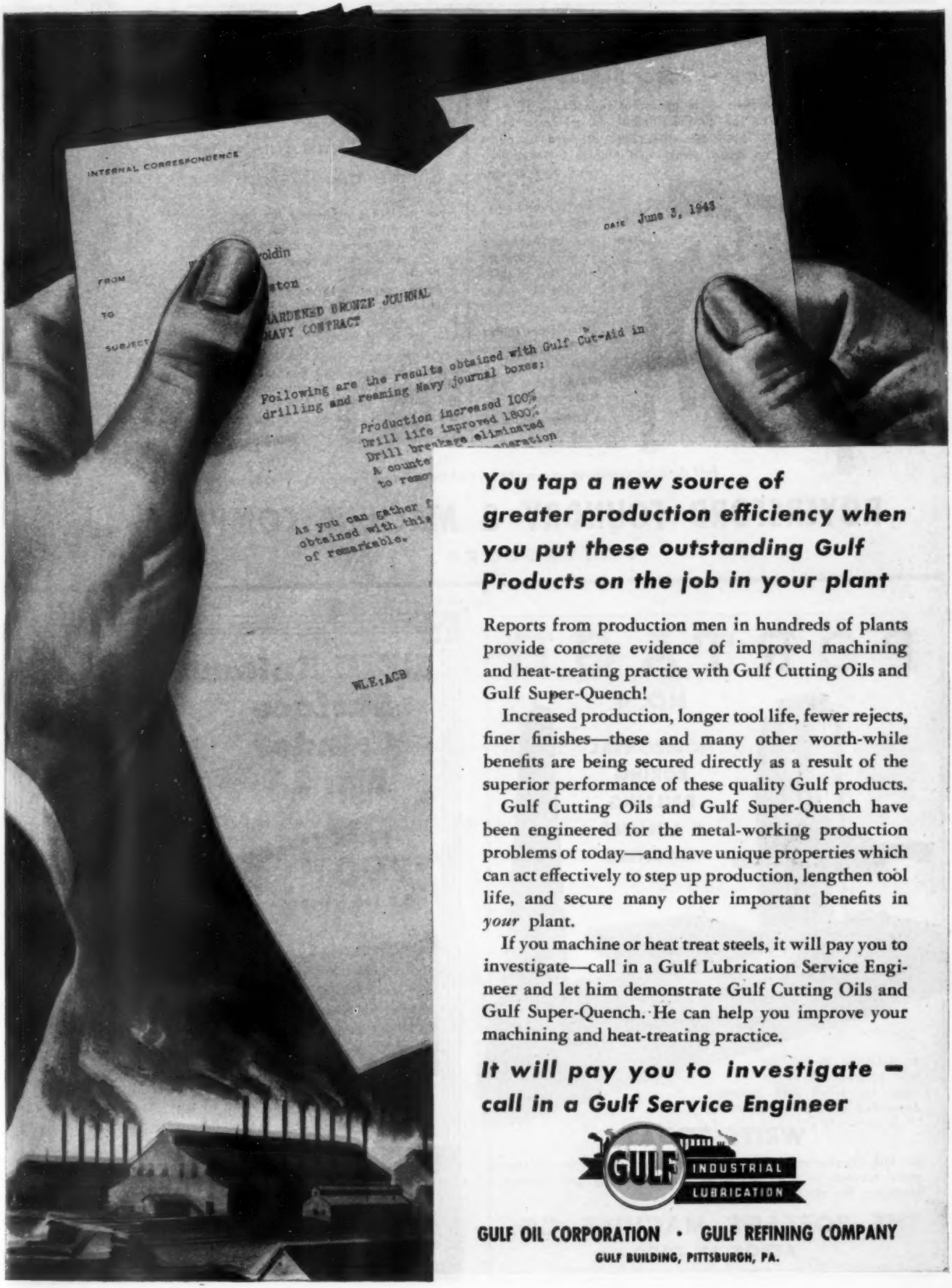
User reports prove the superior performance of
Gulf Cutting Oils and Gulf Super-Quench



You tap a new source of greater production efficiency when you put these outstanding Gulf Products on the job in your plant

Reports from production men in hundreds of plants provide concrete evidence of improved machining and heat-treating practice with Gulf Cutting Oils and Gulf Super-Quench!

Increased production, longer tool life, fewer rejects, finer finishes—these and many other worth-while benefits are being secured directly as a result of the superior performance of these quality Gulf products.

Gulf Cutting Oils and Gulf Super-Quench have been engineered for the metal-working production problems of today—and have unique properties which can act effectively to step up production, lengthen tool life, and secure many other important benefits in *your* plant.

If you machine or heat treat steels, it will pay you to investigate—call in a Gulf Lubrication Service Engineer and let him demonstrate Gulf Cutting Oils and Gulf Super-Quench. He can help you improve your machining and heat-treating practice.

It will pay you to investigate — call in a Gulf Service Engineer

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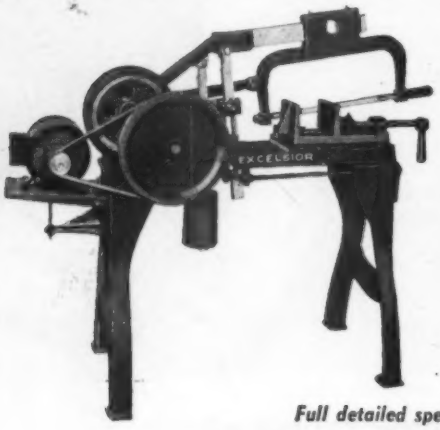
ROYERSFORD-EXCELSIOR

POWER HACK SAW NO. M2A

Saves Time — Saves Blades

The economy of this machine — in operating time and cost — is in large measure due to the provision made to minimize blade buckling and breakage. These advantages are attained by automatically lifting blade on return stroke and placing it in contact with work on cutting stroke. Gravity feed and automatic stopping of saw on backward stroke contribute also to protect against blade breakage.

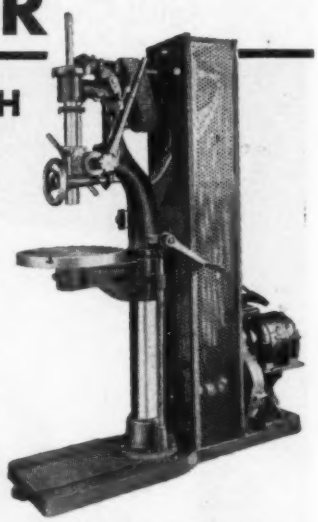


Drive from motor is through milled gears to assure more power and faster cutting.

Cutting capacity 6"x6".

IMPROVED 21-INCH UPRIGHT POWER DRILL

Fast and Accurate, Simple and Sturdy



Every modern convenience for fast precision drilling and easy handling is provided in this Royersford-Excelsior motor driven back-geared drill. It combines simplicity and operating speed with strength and rigidity and can be depended on to drill up to its 1½" in capacity with utmost accuracy.

Gears are machine cut — bearings large and powerful — change from a plain drill to a back-geared drill can be made instantly by merely sliding the gears — spindle is provided with ball thrust bearings top and bottom, counter balanced, and has automatic stop with quick return — table has quick action screw for raising and lowering.

Diameter of table 18"; spindle traverse 9"; spindle to table 29".

Full detailed specifications on these machines available promptly on request.

ROYERSFORD FOUNDRY & MACHINE COMPANY, Inc.

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HORIZONTAL BORING DRILLING & MILLING MACHINE

- Designed and built to meet the need for speed and accuracy demanded of today's production.

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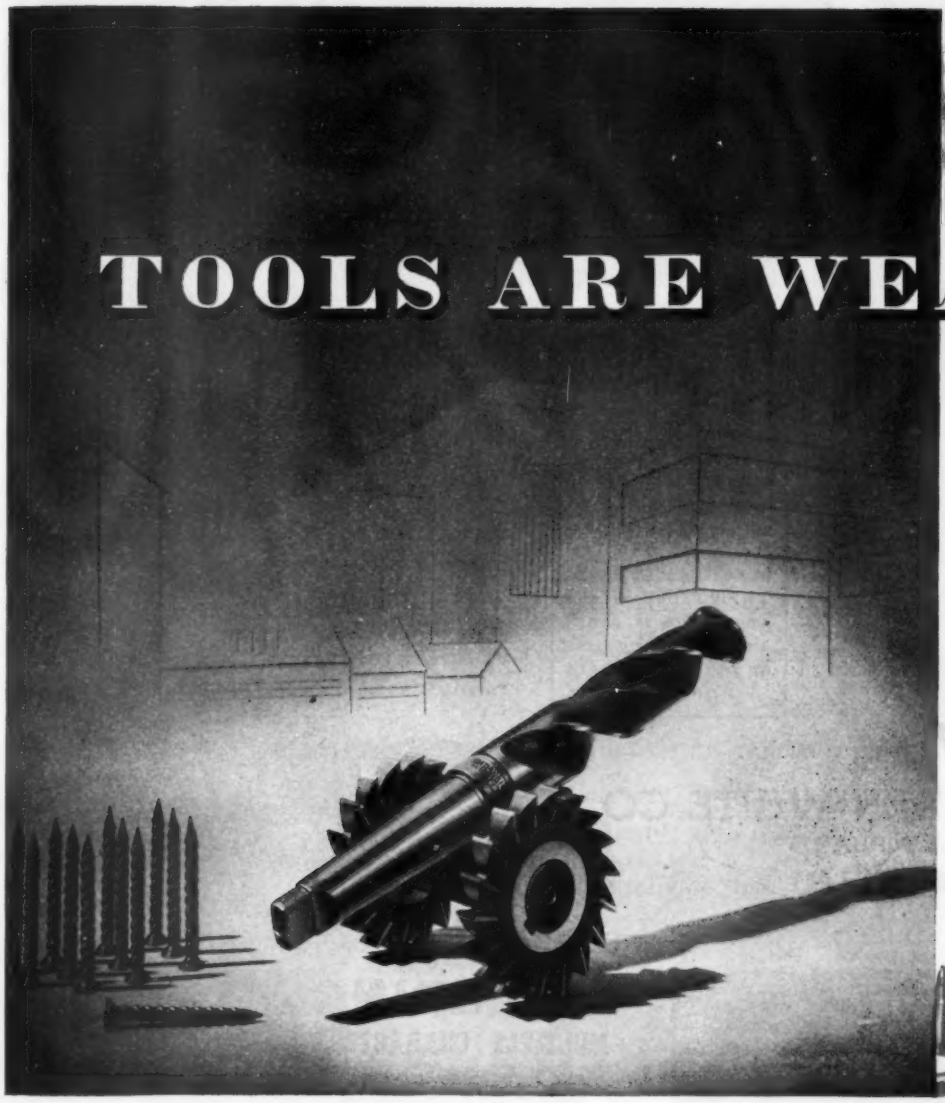

NATIONAL cutting tools are *fighting* tools. They are built to take it—to stand up when the production pace is pressing.

Even the toughest tools produce more work with proper care. That's why the craftsmen who make National tools ask you to sharpen them regularly, be generous with the coolant. Work them hard but work them right!

NATIONAL

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Our Technical Engineering staff is comprised of men experienced in particular fields and machine types. Their specialized knowledge is available to you any time or by appointment . . . no obligation.

That's the opinion not of one . . . nor a few . . . but of hundreds of production men in scores of plants throughout America. And there's a reason. It's one of those all too rare wheels that give:

1. Excellent Finish
2. Maximum Stock Removal
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If you have a surface grinding problem, there's a good chance this 846 K-1 Dayton may be just the wheel you are seeking. Made in a wide variety of sizes . . . with shipment from stock in many cases.

SIMONDS WORDEN WHITE CO.
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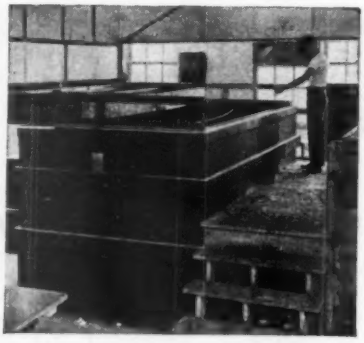
DAYTON GRINDING WHEELS

Fast, Economical Heat Treating Operations, With VULCAN



Immersed Electrode SALT BATH FURNACES

Illustration shows one of a group of VULCAN Immersed Electrode Salt Bath Furnaces for heat treating dural and aluminum alloys for aircraft production. Furnace is designed to assure temperature uniformity within 5°. Troublesome pots are eliminated by improved arrangement of refractory lining containing the salt. Electrodes are widely spaced to prevent overheating and subsequent breakdown of the salt.

High efficiency transformers and air cooled buss bars, eliminating the necessity of water cooling, and properly balanced rolling covers, mounted on ball-bearing wheels, make this furnace especially desirable in high production plants.

Although custom-built, VULCAN Furnaces cost no more than those of standard design, and can generally be installed in a surprisingly short time. Wire, write or phone.

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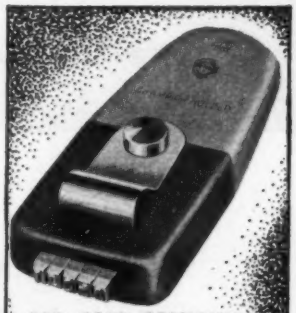

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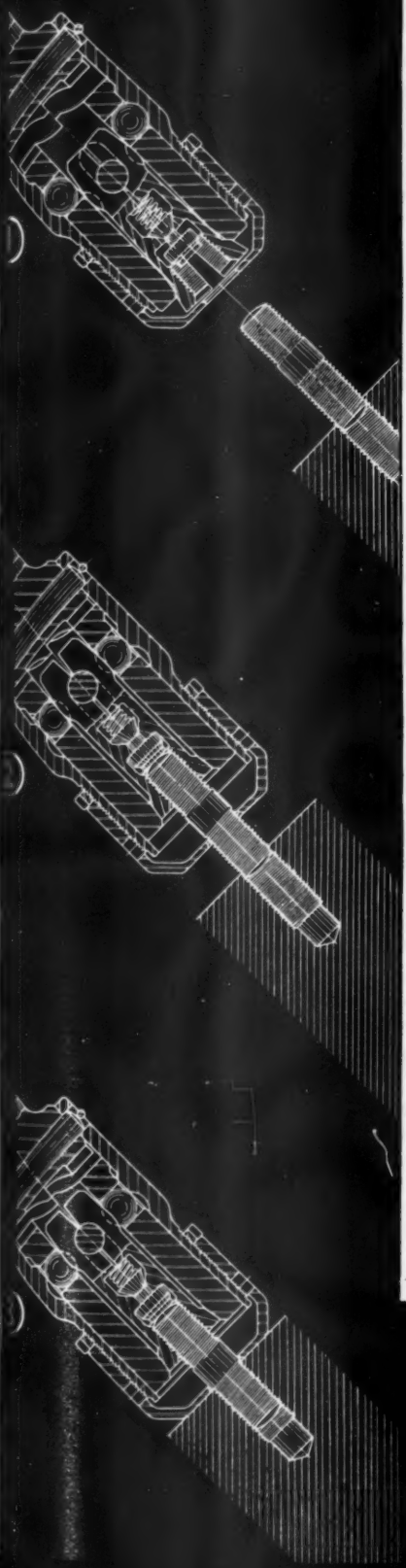
Here's Your Answer to Maximum Stud-setting Speed and Economy



MODERN

SELF-OPENING STUD SETTERS

Make the most of your manpower! Keep your production *up* with Modern Stud Setters — the fastest tools of their kind yet developed.

If you are finding the maintenance of production schedules difficult, these stud-setters can help you greatly. Their terrific speed not only enables fewer men to do the same amount of work but cuts your stud-setting costs as well.

Modern Self-opening Stud Setters have a real dollar-and-cents message for *you*. Do your stud-setting the Modern way.

OPERATION IS SIMPLE, AUTOMATIC, POSITIVE!

The great speed with which this tool operates is due to its simple, automatic, positive action. To understand this action is to know why shops everywhere depend on Modern Stud Setters.

The three drawings at the left show the three steps in Modern stud-setting. 1. Jaws are open to take studs. Clutch is not yet engaged. 2. Driving position with jaws locked on stud and clutch engaged. 3. Stud driven to full depth. Stop collar contacts work, releases clutch and the act of lifting the tool opens the jaws.

Thus you get continuous action. The tool revolves in *one direction only*. There is *no reversing and no stopping*. As a result the operator can set studs almost as fast as he can move from one to another.

Time and Labor Saving Features:

- Does not mutilate threads.
- Drive can be stopped at any point and jaws opened.
- Ball locking device prevents jaws opening until stud is set.
- Rectangular grip relieves jaws of torsional strain.
- Rugged construction minimizes danger of failure.
- Easy, quick removal of broken studs.
- Easily, quickly taken apart—Fourteen parts.
- May be operated in any position.
- May be adjusted for any height stud.

Send for Bulletin M-186 which gives full details concerning these cost-cutting stud setters.

CONSOLIDATED MACHINE TOOL CORPORATION

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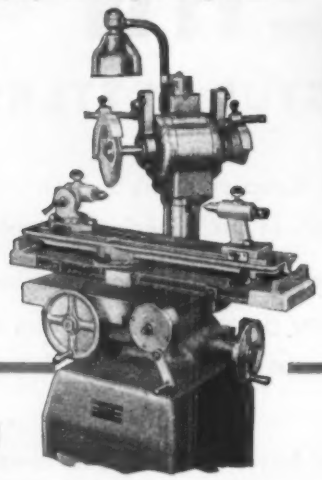
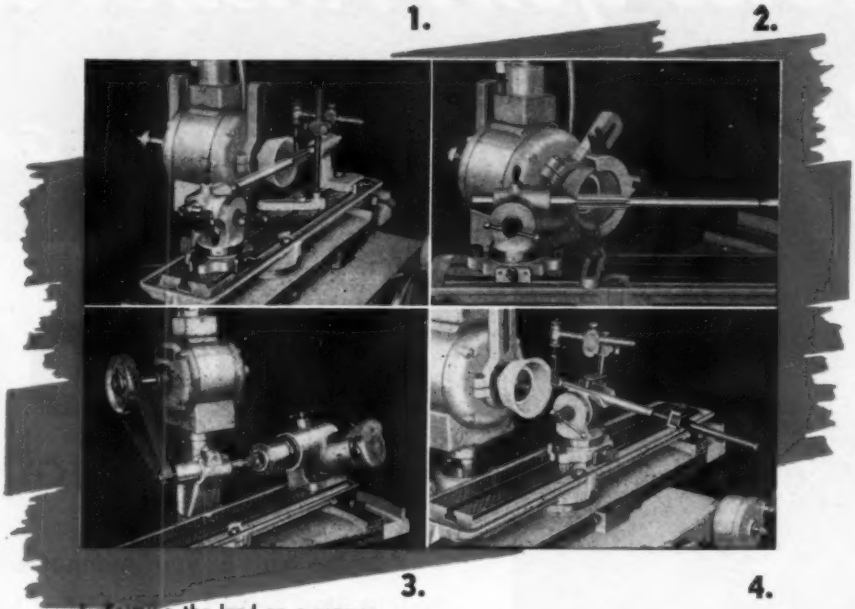
Production or Maintenance — it will pay its way many times



Model B600



1. Forming the land on a reamer.
2. Grinding the 45 degree cutting angle on a reamer.
3. Internal grinding of abrupt taper on production job.
4. Grinding counterbore while held in "V" attachment

New, Illustrated Literature just off the press.

Write for Bulletin UTG-43-AM.

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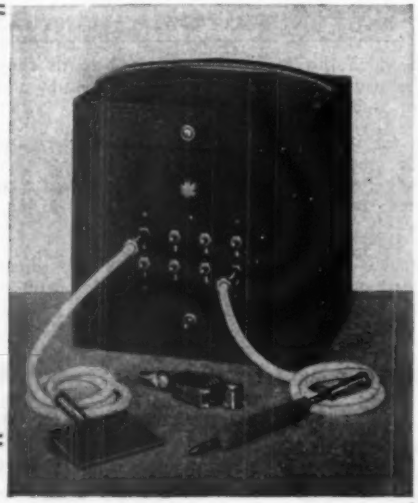

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Etchograph

Way

Mark parts in process, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides—quickly—plainly.

Three sizes to meet all requirements.

Write for circular and prices

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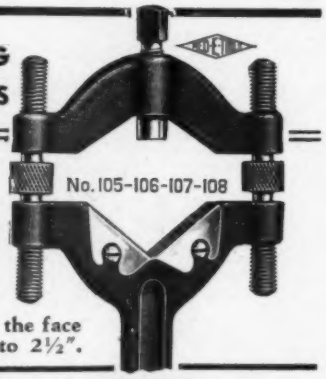
***for* CUTTER GRINDERS**



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Dial Test Indicator

A valuable instrument for erectors and inspectors

Especially convenient for checking accuracy in surfaces and spindle movements; also for obtaining comparative measurements on close work and for lining up work on machine tools. Horizontal arm adjustable and can be removed for independent use. With blocks fitted into T slot of base, this R&S indicator can be used against edge of surface plate for checking accuracy of long horizontal surfaces. Dial diameter 2⅛", base 8½-2¾".

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Dalzen broaches are ground from your blueprints by precision craftsmen with years of experience in broach making. Flat broaches are available in any size; round broaches, in any size up to 72".

When ordering, give make and number of machine, length of stroke, and type of holder.

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This means uniform cutting and increased production from your contour and band saw machines . . . another reason why it will pay you to specify MILFORD PROFILE SAW by name when ordering.

Made and guaranteed by its originators . . . the world's largest producer of metal cutting band saw blades.

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...If you have not yet adapted your band saw machines to Profile Sawing, write us for directions, giving description of your machines and cutting jobs you have in mind.

THE HENRY G. THOMPSON & SON COMPANY
NEW HAVEN, CONNECTICUT
Also makers of MILFORD REZISTOR HACKSAW BLADES

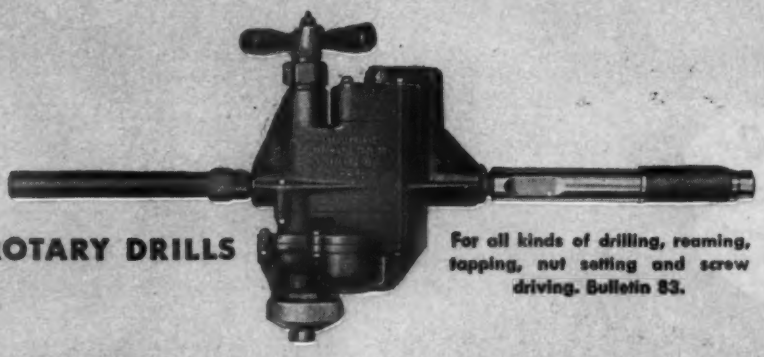
CLECO TOOLS

RIVETING HAMMERS

For heavy duty work with hot rivets. Three styles of handles. Write for Bulletin 82.

CHIPPING HAMMERS

47 sizes and styles for chipping, caulking, beading and scaling. Write for Bulletin 75A.



ROTARY DRILLS

For all kinds of drilling, reaming, tapping, nut setting and screw driving. Bulletin 83.

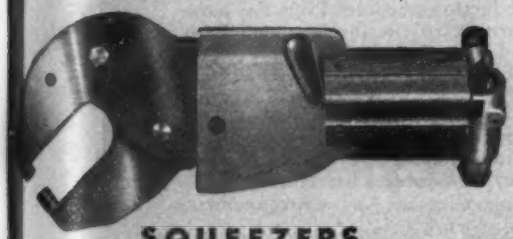
SAND HAMMERS

model for every ...ulding job — for ...or, flask, bench and ...e work. Bulletin 76A.

★ CLECO TOOLS meet today's demand for faster, better production, as well as saving air and reducing maintenance costs. Available in a wide variety of sizes and styles—there is a Cleco Tool for *every* job. All the accessories, too—Bowes couplings, valves, hose, etc. *Write for Bulletins. Also ask for Cleco Cartoons —they tell you how to get better service from your tools.*

ROTARY GRINDERS

35 sizes and types for all kinds of light and heavy grinding. Ask for Bulletin 80.



SQUEEZERS

Model 41-L shown has parallel jaw action, preventing disalignment or loss of rivets. Bulletin 82.

SMALL RIVETERS

For aircraft work. "Slow" and "fast" hitters, with many styles of handles. Bulletin 85.

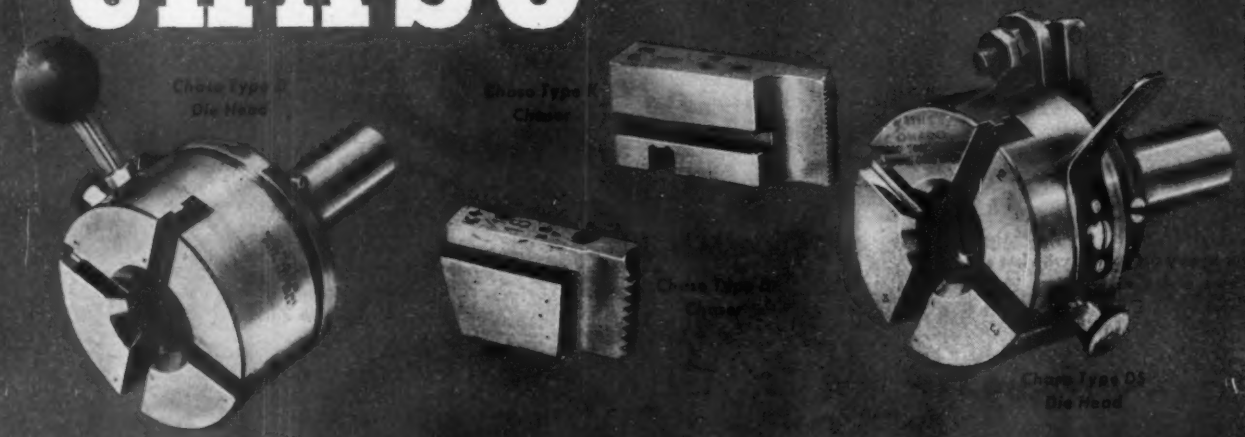
SHEET HOLDERS

They offer the best method of holding metal sheets together prior to riveting. Bulletin 87.

THE CLEVELAND PNEUMATIC TOOL CO.

3781 EAST 77th STREET • *Branch Offices in all Principal Cities* • CLEVELAND, OHIO

CHASO Threading Tools



IT'S Chaso FOR CHASERS!

We make chasers for most of the well-known makes of self-opening die-heads.

● CHASO CHASERS must prove satisfactory in order to fulfill the CHASO guarantee for quality, workmanship and accuracy. It means also that users of CHASO THREADING TOOLS must obtain better service in terms of more threads of closer accuracy between grinds.

● CHASO production methods assure the satisfactory performance of CHASO CHASERS AND DIE HEADS. Write for our catalog.

CHASO TOOL COMPANY, Inc. *Royal Oak, Michigan*

AMERICAN TOOL HOLDERS

★

Here is a really fine tool room tool holder that soon pays for itself because of advanced design details.

Each holder holds three sizes of bits—each bit may be held in four positions—the holder grips the tool with a wide, immovable grip. Write today for descriptive folder.

★

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

CRITERION *Diamond* TOOLS

For STEADY PRODUCTION

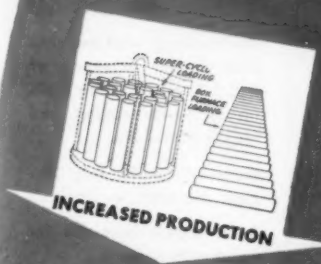
Dependable diamond tools are vital in present production schedules. Every day more users are turning to Criterion Diamond Tools for the kind of service which they must have. Quality of diamonds used plus a unique method of setting assures extreme rigidity and extra tool life. Special tools made to order following blueprints or specifications. Sharp-pointed, selected thread grinding tools. Order direct. Request free literature.

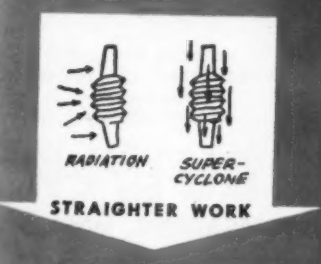
CRITERION MACHINE WORKS

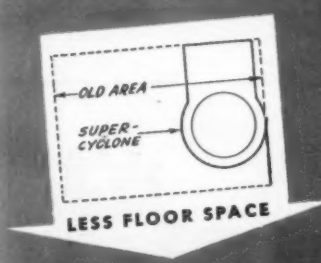
BEVERLY HILLS, CALIFORNIA

You get these advantages with the

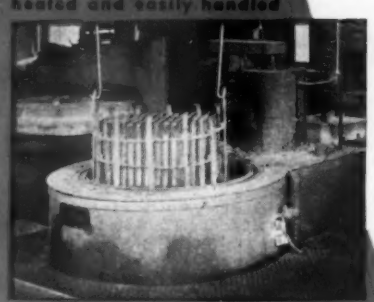
LINDBERG SUPER-CYCLONE







Large loads are accurately heated and easily handled



The revolutionary idea of heating steel to 1750°F. with recirculated air is embodied in the Lindberg Super-Cyclone Furnace. This principle with its accuracy, rapid uniformity and close control of heating offers many advantages, a few of which are listed below.

INCREASED PRODUCTION

The Super-Cyclone Furnace has increased production in the hardening of shells, rifle barrels, flanges, slip yokes, worm gears, bearing races, tank parts and hundreds of similar items. In some cases, production has increased *twelve times* over older methods of heat treating. Bulletin 130 shows how you can figure possible production increases on your own work.

STRAIGHTER WORK

The Super-Cyclone's 100% forced convection heating principle heats the work rapidly and uniformly and eliminates the possibility of one-sided or radiant heat from striking the charge and causing distortion. Straightening time is eliminated or reduced to a minimum. Valuable man hours are released from the press for other work.

LESS FLOOR SPACE

Based on averages of what the Super-Cyclone has done in other plants, you can figure that it will not occupy more than 1/3rd the floor area demanded by conventional equipment to handle the same or greatly increased production.

EXTRA MAN HOURS AVAILABLE

The Super-Cyclone method of handling work on fixtures or in baskets, eliminates the individual handling of parts in heating and quenching. In many plants, lone operators handle large loads through successive steps of heat treatment, for example, forgings are normalized, hardened and tempered in the same Super-Cyclone without being removed from the fixture.

SPECIAL HEATING

Because the Super-Cyclone can be heated at any desired rate to 1750°F. and cooled according to a definite schedule, it is well suited to stress relieving, cycle annealing, malleablizing, and other heating operations requiring a specific cycle. Write for the Super-Cyclone Bulletin 130.

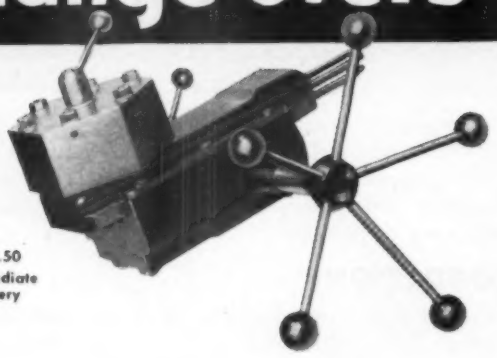
LINDBERG ENGINEERING COMPANY
2445 West Hubbard Street • Chicago 12

ARMY E NAVY

LINDBERG FURNACES

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening

for QUICK change-overs



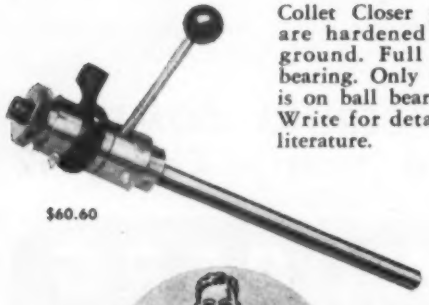
$197.50
Immediate
Delivery

UTILITY TOOLS

In a matter of minutes you can convert your engine lathes into screw machines. Simply remove tail stock and install a Utility Turret and Crossfeed Cut-off. Turret has rack and pinion which assures steady feed. Raised bearing surface eliminates all chip trouble. Has two taper gibs for take-up and alignment. All ways and bearing surfaces are ground. All inserts, bushings and pins are hardened and ground. Hex is 5⅛" across flat, 2-7/16" thick. Accommodates a ¾" hole or a No. 1 or 2 Morse taper. Fits Logan, South Bend, Atlas, Craftsman, 10" Sheldon, Clausing, etc.

Cross Slide pictured here has rack and pinion, two tool holders with adjustable jacks. Weight approximately 40 lbs.

$55.00



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Collet Closer parts are hardened and ground. Full ball bearing. Only wear is on ball bearings. Write for detailed literature.

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SPEED YOUR CUTTING WITH

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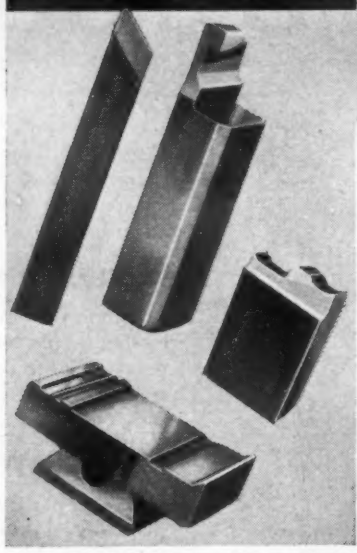
A.C.E.

ACCURATELY MACHINED SPECIAL CUTTING TOOLS



The superior workmanship and greater accuracy of A.C.E. Special Cutting Tools insure faster cutting and longer useful life.

Note—We make only Specials. No tools for stock.

Send urgent inquiries for quick estimates.

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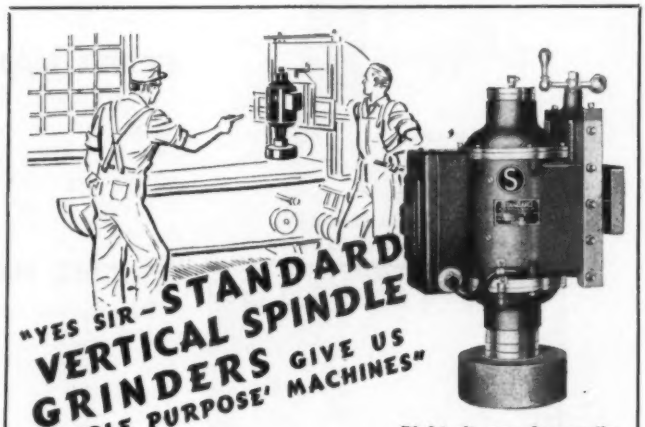
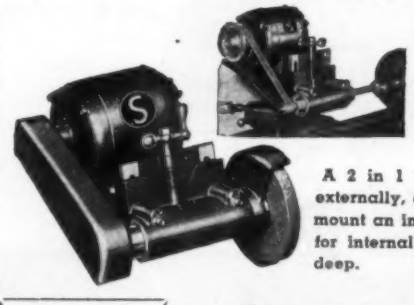
SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS



"YES SIR—STANDARD VERTICAL SPINDLE GRINDERS GIVE US 'DOUBLE PURPOSE' MACHINES"

Right—It can be easily mounted on your Planes, Boring Mills, Shapers, Milling Machines, etc. Adaptable for Wet or Dry Grinding.



PRECISION INTERNAL-EXTERNAL GRINDERS

A 2 in 1 Tool—You can grind externally, and in a few minutes mount an inter-changeable Quill for internal grinding up to 24" deep.

Write for Catalog 43, illustrating a wide range of Grinding Equipment up to 30" wheels. Buffing and Polishing Machines up to 25 H.P., and Speed Lathes

The STANDARD ELECTRICAL TOOL Co.
CINCINNATI • OHIO
2490 RIVER ROAD

THIS "HEAD" GROUND THE POWDER

THAT GROUNDED THE NAZI PLANE

It's a long trail from Nazi debris in Flanders to the Disston works in Philadelphia. But, gun powder . . . at the end of its trek from the cotton fields of Dixie . . . comes out of a machine in strands like spaghetti—it then must be reduced to granular form.

So, one of the many special tools made by Disston is a superior cutting tool called a powder head, including knives. Its efficiency is largely due to the accuracy with which the angular slots for the knives are cut into the head by a special Disston process. And longer life is given to the knives by a special steel developed by Disston.

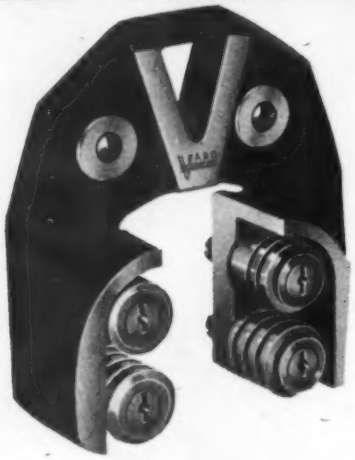
First comes Disston engineering; then Disston craftsmanship. The result is the *extra* quality that distinguishes *every* Disston tool.

The engineers at Disston are continually finding ways to improve the performance of tools for unusual purposes. And, into their manufacture goes the craftsmanship responsible for the extra quality of the *standard* Disston tools you know so well . . . wood and metal-cutting saws, files, hack saw blades, tool bits, machine knives, etc. For helpful information about Disston products, write Henry Disston & Sons, Inc., 1020 Tacony, Philadelphia 35, Pa., U. S. A.

DISSTON

Conserve Man-Minutes and help win the war

VARD



ACME SNAP GAGES

With a VARD Acme roll thread snap gage, external Acme threads can be quickly gaged for accuracy as to thread form, lead and thread thickness in one motion as the gage is slipped over the thread. If the Acme threads on the work are correct within the tolerance of the gage, the threads will pass through the "Go" rolls and will be stopped by the "No Go" rolls. Work can be checked for accuracy while still in the machine.

VARD Acme roll thread snap gages have John-Sons type rolls and the same gages can check either right or left hand threads in work of any size up to 12-in diameter.

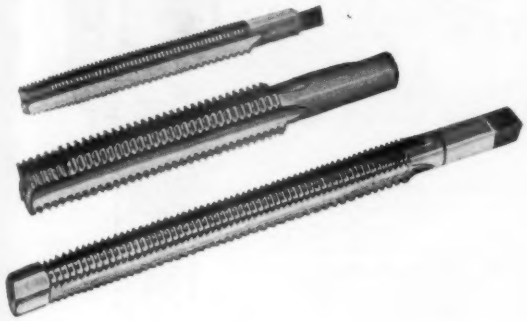
ACME RING GAGES

VARD Acme thread ring gages are made in either right or left hand thread in sizes from ¼-in. diameter. VARD ring gages are made from the finest grades of tool steel and are specially hardened and ground to your specifications. All Acme gages must be made to your special order, as tolerances vary with conditions they are engineered to meet. VARD gages are mechanically and optically measured for accuracy before shipping.

ACME PLUG GAGES

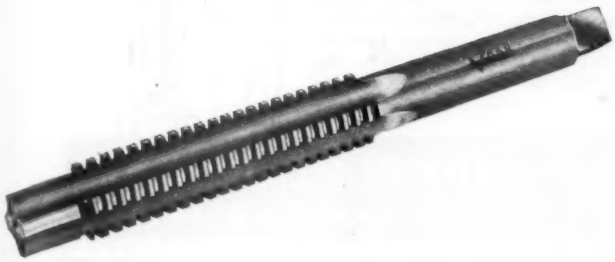
VARD Acme thread plug gages are manufactured in a complete range of sizes from ¼-in. to 12-in. diameter. These gages are available in "Go" or "No Go" members and in either right or left hand thread. Ground from selected tool steels, the VARD Acme thread plug gages are produced in standard or modified Acme forms in either single or multiple lead. These gages, unless otherwise specified, are made to AGD standards. They are fitted with light weight handles.

ACME



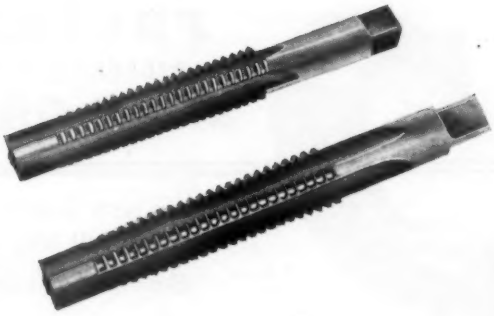
ACME TAPS

VARD is equipped to produce Acme thread taps in any size from ¼-in. diameter on up. Acme taps are made to special order. All VARD Acme taps have ground threads and can be furnished in either high speed tool steel or carbon steel. VARD Acme taps may be obtained in multiple lead, spiral flute, standard or modified thread forms.



IN SETS

In many materials or conditions it is necessary to cut Acme threads in progressive steps. VARD Acme taps may be secured in sets of 2, 3 or 4 taps. In ordering, specify the material of and length of nut to be threaded. We will make recommendation as to number and conformation of taps required to do the job quickly and accurately.



COMBINATION

VARD also produces Acme combination taps with roughing and finishing taps on one shank. For high production in such materials as brass or mild steel, this type of tap works exceptionally well. Write for information, giving material specifications. We may be able to help you speed up your Acme threading.

VARD INC.

PASADENA, CALIFORNIA

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SECOMET
DIAMOND WHEELS

When the war is won—Americans will enjoy higher standards of living than ever before. Motor cars, airplanes, trucks and tractors, home appliances, every machine and tool that's made of metal, will be better, safer and stronger. JKS Diamond Wheels will help to make this possible by processing tougher metals, with greater precision. Far-sighted companies are already designing new products, scanning new outlets and perfecting plans for cutting their costs with improved machine tools. To such executives this is an invitation to write today to—

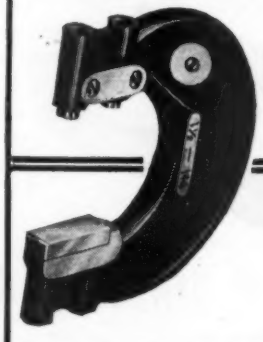
J. K. SMIT & SONS
157 Chambers St., New York, N. Y. 6400 Tireman Ave., Detroit, Mich.

Ⓚ

UNIVERSAL CENTERING CHUCK SAVES TIME • SAVES MONEY

Now you can easily, quickly and economically convert any medium sized drill press into a centering tool with the efficient Universal Centering Chuck. With this chuck work from screw machines that has been centered on one end can be set on the press and rapidly centered on the other. A feed adjustment regulates the depth of center. Concentricity and uniform depth of centers are maintained. Write for further facts.

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN



PHOENIX
ADJUSTABLE LIMIT SNAP GAGE

A Gage with Locking Cams which will stay set

Good Delivery

Send for Folder

PHOENIX GAGE CO., Phoenix, N. Y.

CRAFTS

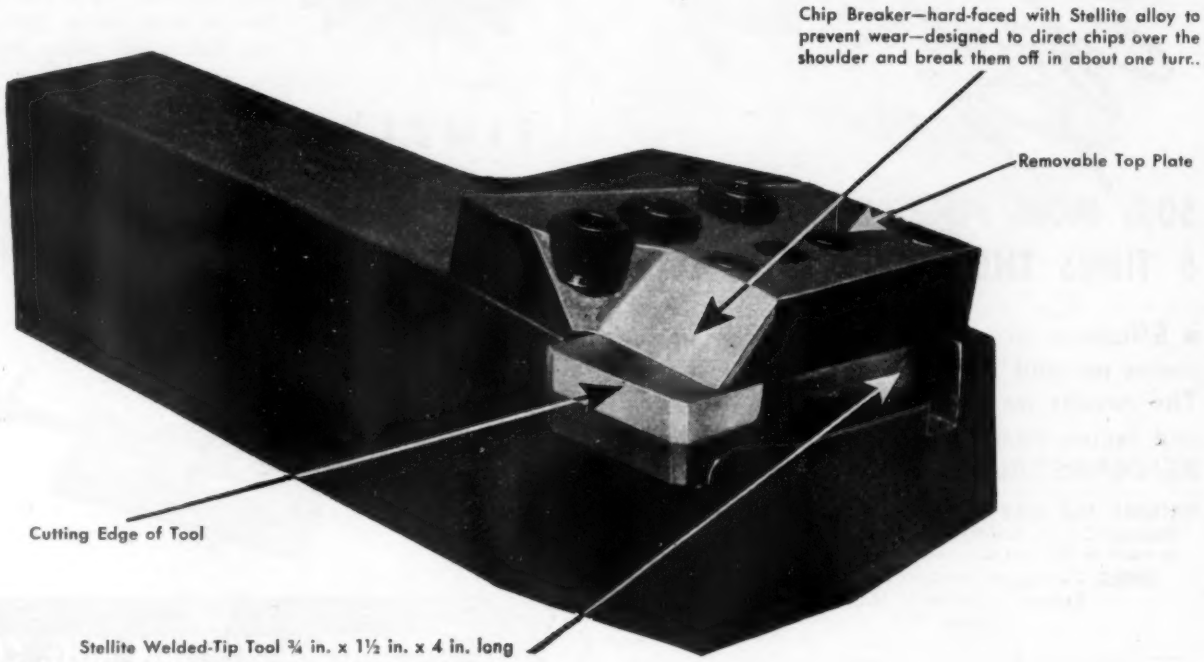
Consistent Quality

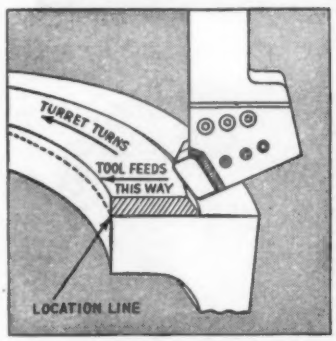
GAGES AND TOOLS

ARTHUR A. CRAFTS COMPANY, INC.

603 Newbury Street
at Kenmore Sq. BOSTON
DETROIT · CHICAGO

This Tool Holder *uses small Stellite tools on big jobs and cuts tool cost and grinding time*


Chip Breaker—hard-faced with Stellite alloy to prevent wear—designed to direct chips over the shoulder and break them off in about one turr..
Removable Top Plate
Cutting Edge of Tool
Stellite Welded-Tip Tool ¾ in. x 1½ in. x 4 in. long



The tool holder shown above holds a Stellite-tipped tool for rough machining the bottom face of the cast armor steel tank turret as shown in the simplified cross-section sketch at the left. Surface speed is 65 ft. per min.; feed is 0.040 to 0.060 in. per rev.; and the depth of the cut varies from ⅜ in. to more than 1 in. Holders for both right- and left-hand heads of the machine use identical tool bits.

The tool holder shown here has made possible important savings in overall costs of heavy machining operations on combat tank turrets of cast armor steel. This is because the holder permits use of small Stellite-tipped tools, with resultant savings in original tool cost, in tool-metal consumption, and in grinding time. Rake angles are incorporated in the tool holder, and only a simple relief angle needs to be ground on the tool itself. Holders for both right- and left-hand heads of the machine use identical tool bits. Adjustment of the tool to compensate for wear is in the line of wear, so tool life is considerably prolonged.

Full Cutting-Edge Support

Tool breakage is reduced to a minimum because this holder supports the tool directly under the cutting edge. This support permits full utilization of the heavy feeds and deep cuts that Stellite tools can take. Since the tool is wider than the deepest cut encountered in this work, only one corner of the cutting edge of the tool is working at a time. A dull tool, therefore, can be turned over and used in the opposite head without being reground.

Detail Drawings Available

Haynes Stellite Company does not make or sell this holder. But if you believe that Stellite tools and holders of this type would be useful in your work, further information —and detail drawings of the holder—can be made available without cost.

BUY UNITED STATES WAR BONDS AND STAMPS

STELLITE
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HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York 17, N.Y. UCC Kokomo, Indiana

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• HIGH-PRODUCTION METAL-CUTTING TOOLS •

"Stellite" is a registered trade-mark of Haynes Stellite Company.

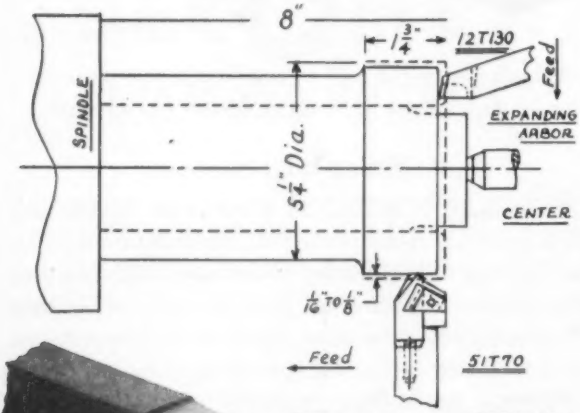
KENNAMETAL *Efficiency Plus...*

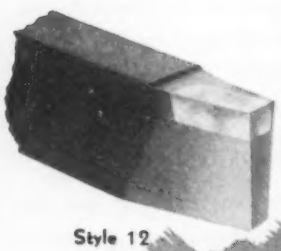
50% MORE PIECES PER GRIND AT 5 TIMES THE PRODUCTION RATE

• Efficiency in steel-cutting depends upon pieces per unit of time including down time. The results on the following job, turning and facing cam bodies demonstrates how KENNAMETAL assures *efficiency* . . . plus.

MATERIAL: SAE 2512 forging—Carburized and hardened to 35 Rockwell C (331 Brinell) Forgings rough, with heavy scale and as much as ¼" out of round.

TOOLS: Turning—KENNAMETAL Style 51T70
Facing—KENNAMETAL modified Style 12T130
Grade—KM





Style 12

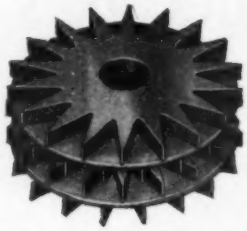
FEED: .019" **DEPTH:** ⅛"
SPEED: 120 RPM
SURFACE FEET PER MINUTE: 165
NUMBER OF PIECES PER GRIND:
High Speed Steel—100
Kennametal—160
CUTTING TIME:
High Speed Steel—5 min.
Kennametal—1 min.

• *One and a half times as many pieces per grind at one-fifth the unit time!* This is KENNAMETAL's answer to the problem of efficient steel machining.

Write today for your copy of the new catalog 43C containing information on the care, handling and selection of KENNAMETAL tools.

KENNAMETAL *Inc.*
103 Lloyd Ave., Latrobe, Pa.

Trade Mark Reg. U. S. Pat. Off. Foreign Sales: U. S. STEEL EXPORT CO., 30 Church St., New York (Exclusive of Canada and Great Britain)



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GRINDING WHEEL DRESSERS & CUTTERS

We manufacture a complete line of wheel truing tools and can supply the proper dresser for each of your grinding wheels.

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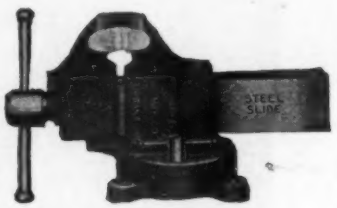
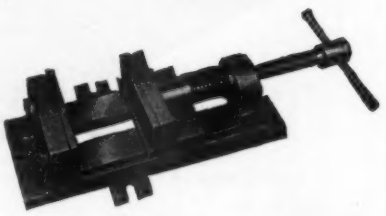
A full line of Machinists, Welders, Filers, Production and Drill Press & Milling Machine Vises with solid steel slides.



Write for copy of catalog "A" and name of your nearest dealer who can supply you.



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THE
DESMOND-STEPHAN MFG. CO.
URBANA • OHIO

Because of its extreme accuracy, ease of handling, versatility of use and other advantages, MASTER RULE has come to be the outstanding choice of men who appreciate and *demand* these qualities in a steel rule.

NEW RULE BOOK

The new MASTER "Rule Book" simplifies the use of steel tapes and wood rules. In it, pictures *show* you, words *tell* you, how to use your measuring tools to the best advantage. Sixteen pages crammed with facts and advice. Convenient pocket size edition.

Master Rule Mfg. Co., Inc.
815 E. 136th St., N. Y. C., Dept. P-10
Please send me, without charge, "Rules for Measurement"
Name_____
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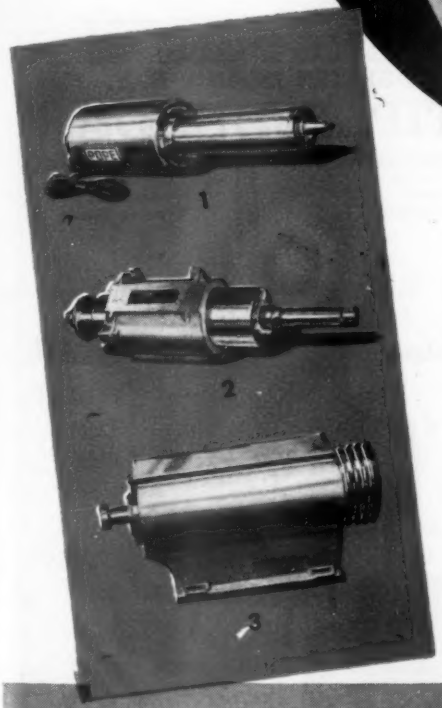
City_____ State_____

Branch: 541 S. Spring St., Los Angeles, Calif. Dept. P-10

MASTER
WOOD AND TAPE RULES

The POPE SEALED PACKAGE



POPE Spindles don't come wrapped in cellophane but in a sturdy box. The idea we want to register is that each Spindle is a complete, self-contained *package* in itself — ready to slip into the grinder and do a precision job from then on, without oiling, greasing or attention of any kind. You'll never burn your fingers on a POPE Precision Spindle. They run cool at top speeds hour after hour. The lubricant is sealed *in* — dirt is sealed *out*.

There is a POPE Spindle for every purpose. Above is a tool and cutter grinder spindle, at the left (1) a 6" x 18" surface grinder spindle with totally enclosed fan cooled motor, (2) a high speed spindle for winding glass thread, (3) a special wheel head for grinding aircraft and tank bearings.

Let us give you the whole story. New Bulletin "A" upon request.

POPE

POPE MACHINERY CORPORATION

Haverhill, Mass.

BUILDERS OF PRECISION GRINDER SPINDLES

DETROIT AGENT: *James W. George Machinery Co., 3146 East Jefferson Avenue*

THIS UNIVERSAL PRECISION INDEXING HEAD

can be used on any tool or surface grinder!

It holds all the tools shown at right, and can easily be adapted to hold many others. Graduated 360° in three planes, for every simple or compound angle. Vernier lever will rotate work collet between indexed points without changing index or location of tool in collet. Accurate . . . useful . . . adaptable Prompt delivery.

Write for illustrated circular.

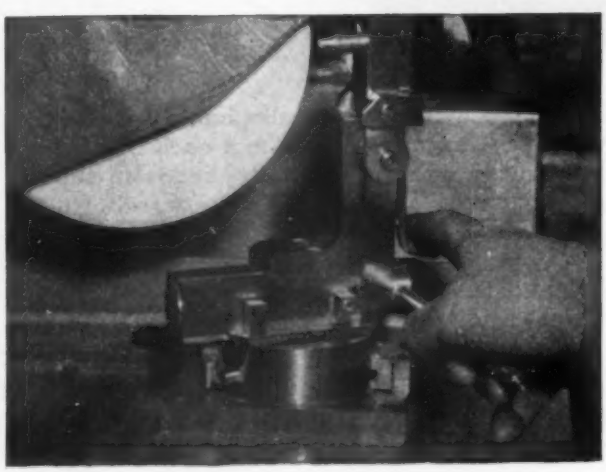
1. Straight shank tools up to 1" diameter are held in standard Hardinge collets.
2. No. 4 Morse taper, or conversion collet from No. 4 Morse taper to No. 9 B & S.
3. Also holds tools with No. 9 B & S taper shank.

CLEVELAND TOOL ENGINEERING CO.

1253 WEST 4th STREET • CLEVELAND 13, OHIO

A RADII & ANGLE DRESSER

OF PRECISION AND VERSATILITY



An instrument of precision and versatility . . . Operation is simple requiring no high degree of skill for accuracy . . . Any one of the following can be produced with one setting:

One angle
Two angles
Concave radii up to 6"
Convex radii up to 4½"
Two angles and radius.
Many other diversified forms to meet requirements.

Wheel size capacity—14" dia.; angular travel 3"; for use on universal surface and cylindrical grinders.

Full details available on request.

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J. & S. TOOL CO. 477 MAIN ST. EAST ORANGE N. J.
PRECISION DRESSING TOOLS

ERRINGTON

STAPLETON, STATEN ISLAND, N. Y.

MULTIPLE HEADS

Super-Sensitive Fixed Center Multiple Drilling Heads

Fixed-Center Auto-Reverse Multiple Tapping Heads

All Parts Fully Enclosed to Insure Pressure Lubrication and Rigid Support of Adjustable Spindles

ADJUSTABLE MULTIPLE SPINDLE DRILLING HEAD

MORE HITS • FEWER ERRORS

Official U. S. Navy Photo

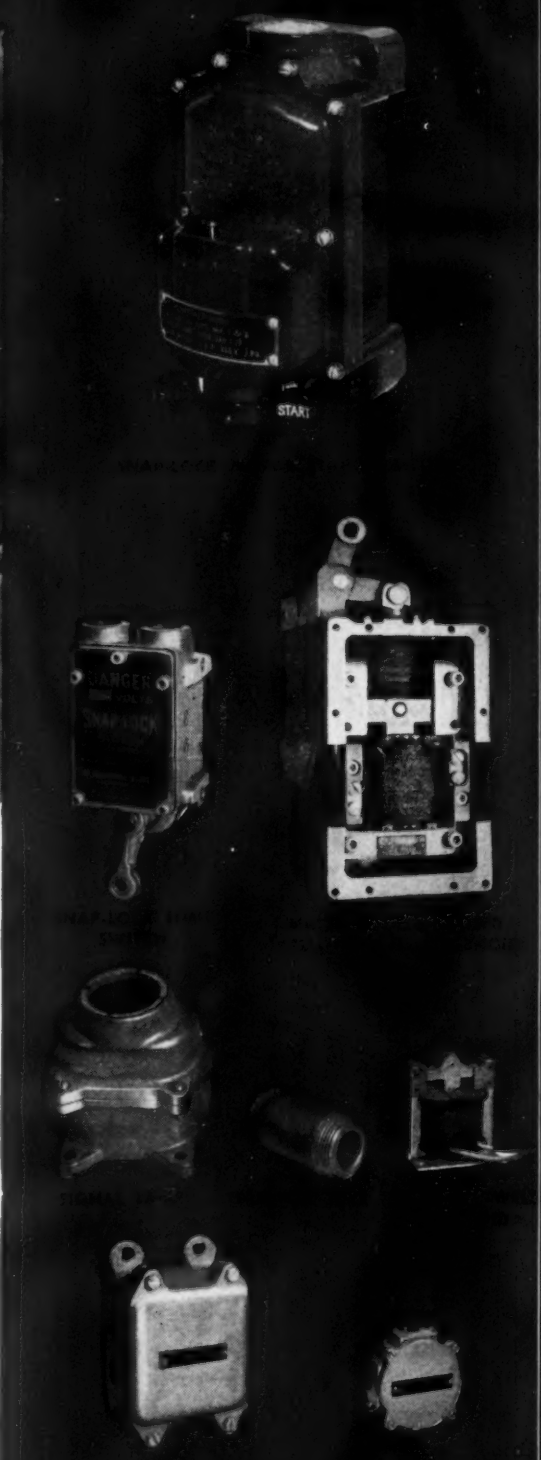
Our gunners are constantly doing a more effective job of knocking enemy planes out of the air. Two reasons—better trained men and better guns.

National Acme takes special pride in the fact that we have been permitted to make some contributions to these better guns, working in close co-operation with the manufacturers who are building them, and with the Bureau of Ordnance of the Navy.

The broad experience and inventive skill of our Electrical Manufacturing Department, have been called upon to design and produce certain electrical devices that are important in aiming and firing the latest types of antiaircraft weapons.

Details, of course, cannot be disclosed. But several of our standard products, such as Snap-lock Motor Control Switches, Snap-lock Limit Switches and "Stellite"-weld Solenoids are included.

This same type of electrical equipment will naturally find its place on the more efficient and more dependable machines to be made after peace comes.



THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES

Liberty Attachments
For Surface Grinders

Adapted for Use on Most Surface Grinders

Horizontal
C 90-30
Chuck Type

FOR PRECISION GRINDING

On and off in a jiffy. Increase the capacity of your surface grinders by 50% yet require no additional floor space. Operating speeds from 14,000 to 26,000 rpm under load. Employ wheels up to 1¼". Both horizontal and vertical models for handling a great variety of intricate work. Send for illustrated circular.

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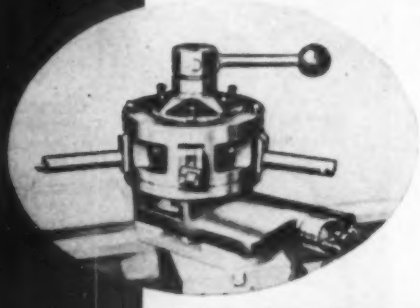
TOOL & GAGE WORKS, INC.
241 Georgia Ave. Providence 5, R. I.
TOMORROW'S TOOLS FOR TODAY'S TASKS



Improved
5-STATION TURRET HEADS

GET MORE WORK FROM YOUR ENGINE LATHES . . .

These improved Turret Heads provide a practical, efficient way to speed up operations and make production tools out of ordinary engine lathes. They are available for quick and easy installation on lathes from 9" to 30" Swing and require no special skill to operate. To change tool stations, all that's necessary is to turn handle ¾ revolution, lift it 45° and turn the head easily in either direction to any one of the ten index positions provided. Any one of 5 separate operations can be performed without resetting tools or changing work. Boring bars can also be used. Savings in tool bits, rigid operation and heavier cuts are assured by the fact that ordinary tool bits, without special adapters, can be used in these heads. *Send today for Descriptive Bulletin giving details of design and sizes available.*

AUTOMATIC MACHINE & TOOL CO.
132 Charles St., Auburndale, Mass.

HAVE *Specialists* PRODUCE IT FOR YOU

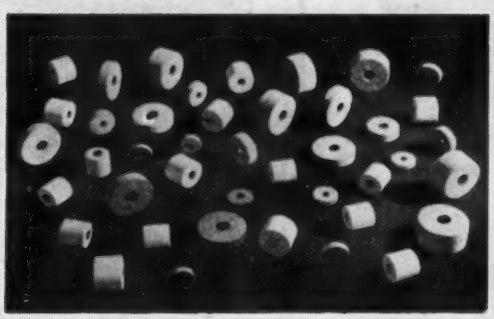
Every cutting tool produced by Motor Tool is a special job—designed for a special purpose. We make no stock types. The only thing standard about the tools we build is the quality that goes into the making. If you want a special tool that will exactly meet the requirements of the work—place its production in the hands of specialists. Our Engineering and Designing Service is at your disposal.

MOTOR TOOL MANUFACTURING CO.
METAL CUTTING TOOLS
7777 CORTLAND AVENUE · DETROIT, MICHIGAN
Make it a Rule to Call Motor Tool

Suppose *You* were on a Bombing Mission Today!

You would want that plane to be perfectly constructed, wouldn't you? You would worry a lot (and so would we), as the bombs were dropping, about the precision of every part in the plane—something our pilots take for granted every time they leave the ground! You would probably come back from the raid grimly determined that you would do everything possible to assure the accuracy of each and every part your plant produces, whether it be for planes, tanks, or guns!

You would check over your machinery and, no doubt, study ways to improve your grinding equipment. You would welcome any suggestion that might make your grinding safer, faster, and better. If you are like hundreds of other factory men, you would call in a Sterling engineer for consultation on the proper "Wheels of Industry" to use. By doing this, you would find new types of Sterling Grinding Wheels, built especially for your job.



• Accuracy is assured with every Sterling Internal Grinding Wheel you use.

The services of a Sterling engineer cost you nothing. By writing us today for assistance, you avail yourself of his experience on hundreds of wartime grinding problems. No doubt, you will increase speed and quality of your production by using the wheels he recommends. We believe it is worth a trial . . . may a Sterling engineer call right away?

TUNGSTEN
CARBIDE TIPPED TOOLS
Price $1.00 Each In Any Size

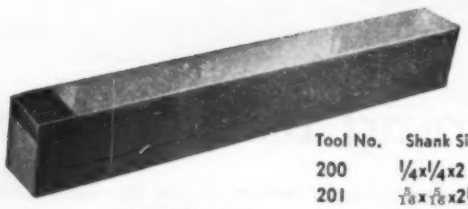
New Low Prices—Increase Production—
Cut Operating Costs

Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials such as hard rubber, bakelite, fibre, and tough alloy steels up to 500 Brinell hardness

Left Hand-Reverse Image. Right Hand Shown

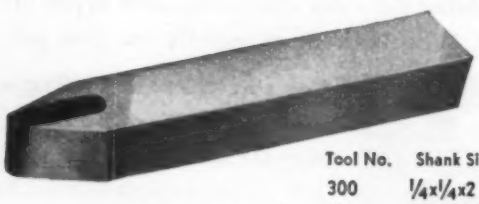
SERIES 100

Tool No. RH	LH	Shank Size
R-100	L-100	1/4x1/4x2
R-101	L-102	5/16x5/16x2 1/4
R-103	L-104	3/8x3/8x2 1/2
R-105	L-106	7/16x7/16x3
R-107	L-108	1/2x1/2x3 1/2



SERIES 200

Tool No.	Shank Size
200	1/4x1/4x2
201	5/16x5/16x2 1/4
202	3/8x3/8x2 1/2
203	7/16x7/16x3
204	1/2x1/2x3 1/2



SERIES 300

Tool No.	Shank Size
300	1/4x1/4x2
301	5/16x5/16x2 1/2
302	3/8x3/8x2 1/2
303	1/2x1/2x3 1/2

Standard Tungsten Carbide Tipped Tool Bits

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lots of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

WE CARRY SILICON CARBIDE EMERY WHEELS FOR GRINDING TUNGSTEN CARBIDE TOOL BITS

Send for our latest circulars

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SAFELY PREPARING ALUMINUM FOR ANODIZING
In preparing aluminum surfaces for anodizing, aircraft and other plants have found that a CHEMICALLY CLEAN condition is indispensable in securing an anodized coating or film of the desired UNIFORMITY, ADHESIVE PROPERTIES and DURABILITY.
That's why so many plants use SAFE Oakite Aviation Cleaner. It thoroughly, speedily removes all grease, oil or other foreign matter . . . rinses freely . . . does not pit, etch or discolor aluminum surfaces. Details FREE! Write TODAY!
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Technical Service Representatives Conveniently Located in All Principal Cities of the United States and Canada
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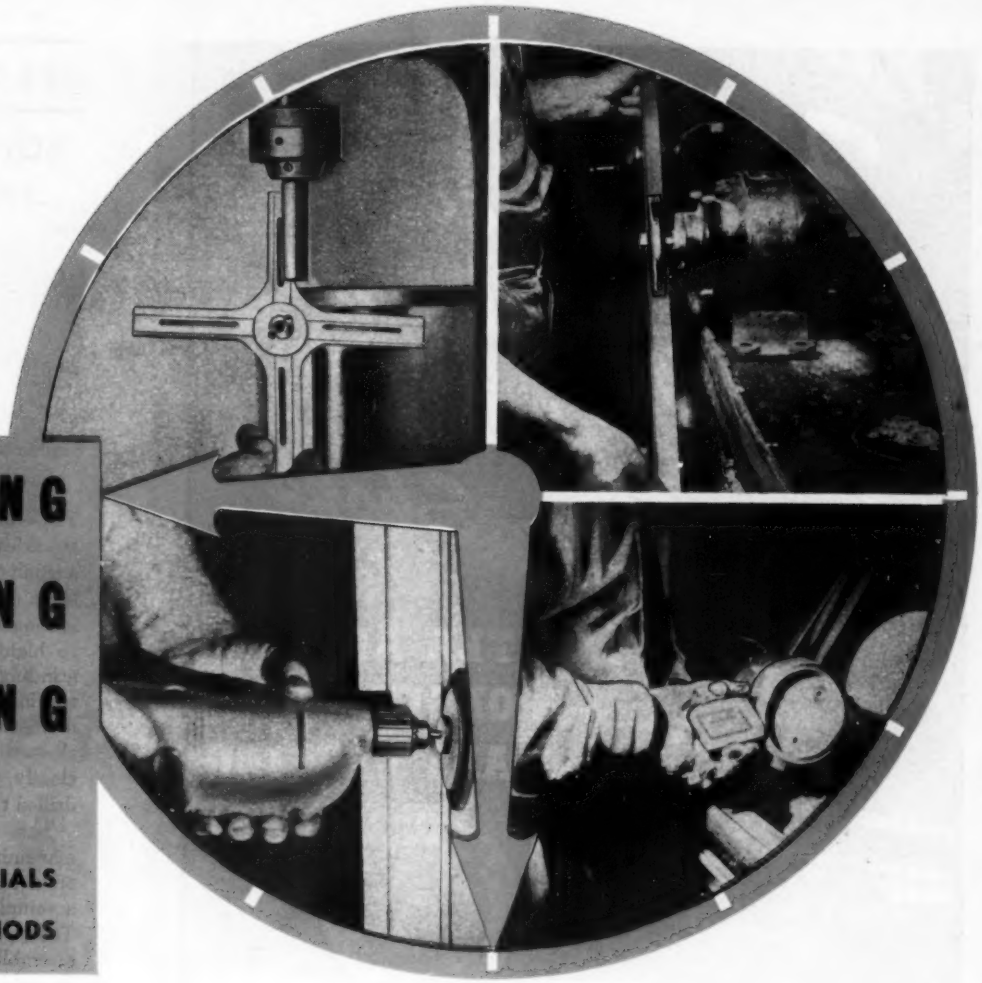
BLADES FOR CENTERLESS GRINDERS . . . TIPPED WITH TUNGSTEN CARBIDE
Assure Greater Production and Accuracy in the finish grinding of bullet cores, armor-piercing shot, shells, projectiles, tank parts, aircraft engine parts, rifle and machine gun parts.
TALIDE
METAL CARBIDES CORPORATION
YOUNGSTOWN, OHIO



DE-BURRING
FINISHING
POLISHING

1943

WORK-SAVING MATERIALS

TIME-SAVING METHODS

HERE are four cases where all in one de-burring, finishing and polishing jobs have been accomplished in a single operation by Brightboy—an *original* and unconventional abrasive.

Time and work savings—*plus* a smooth, precision finish which frequently serves as a final polish—are achieved because of Brightboy's unique composition and working effectiveness. Brightboy is *rubber*, impregnated throughout with abrasive. Its "give" or resiliency creates the result which has led to its immediate approval and wide adoption in hundreds of war plants.

Try Brightboy on one of your jobs. Time the operation and compare the results. Write us if your dealer cannot supply you with Brightboy METHODS AND APPLICATIONS DATA, prices and catalogs. Brightboy field representatives are at your service.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
Newark, N. J.

3 TEXTURES

BRIGHTBOY STANDARD
for all-around metal finishing

BRIGHTBOY FINE-TEX
for lighter work—
for fine polishing

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for harder metals

WHEELS · STICKS
RODS · TABLETS

for manual and machine operations

WELDON ROBERTS

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REG U.S. PAT. OFF.

Fabricating a Special Boring Mill Bed at United Welding Shops

LIGHTER AND STRONGER THAN ANY CASTING

WELDING ENGINEERS · UCO · MIDDLETOWN, OHIO.

The war over, the machine tool industry will be concerned largely with the design of special tools for single purpose operations. That is where the welded steel fabricator comes in. He can form and weld the frame or housing, and various other parts, in the time it would ordinarily take to make patterns. And he can hold the cost down.

He will also produce the part faster and it will be lighter and stronger. Rounded corners that help style the unit, and many other contours that would puzzle the foundryman, can be produced with ease.

Arc welding is not "coming in". It is here. And United Welding has the equipment to cut, form, weld, anneal and sand blast parts up to many tons.

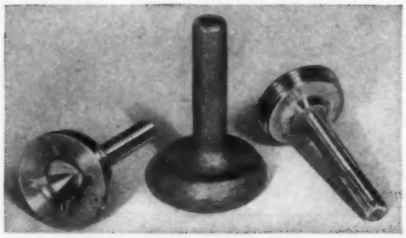
Submit your design. Your drawings and quantity required are all that is necessary.

THE UNITED WELDING CO.
MIDDLETOWN, OHIO

WELDING FABRICATORS OF MODERN DESIGNS

PRECISION PARTS

BOLTS FOR DRIVING THE ENEMY NUTS



An airplane depends on this.

These fine precision-machined pieces ride the skies all over the world. They are only a small part of Uncle Sam's swift-moving ships of the air—but a vital part. They are machined at Ace from rough forgings to highly accurate finished pieces. The grinding of the threads, as well as the turning and grinding of the various diameters, must be held to exceptionally close tolerances . . . and, if you look closely, you'll see an .060" diameter hole drilled through the thickness of the head.

The ability to do highly accurate machining and grinding . . . and to do it on a mass production basis . . . is an accomplishment this war has taught us. Today, when you need small parts or assemblies come to Ace, and we will try to fit them in with our present production. Here you'll find not only the modern precision machinery, but the skill, the background, and the ingenuity to use those machines to get the required results.

The Ace story on precision work will interest you. Send for a copy.

ACE
TRADE MARK

ACE MANUFACTURING CORPORATION
for Precision Parts

1207 E. ERIE AVE., PHILADELPHIA 24, PA.

The same Cross-Section and Proportions but..

No, these three files are **NOT** *identical*

In Swiss-Pattern files, the Pillar, Equaling, and Square Edge Joint types have practically the same cross sections.

But these types have definite differences which make them suitable for different kinds of work. The Pillar is double-cut on the sides, but safe (uncut) on the edges; the Square Edge Joint is double-cut on the edges but safe on the sides; the Equaling is double-cut all over.

This illustrates the wide variety which is available in Swiss-Pattern files, providing an exactly suitable type for every kind of work. And in "American Swiss" Swiss-Pattern Files, you get this variety with utmost accuracy of size and cut, with uniform hardness assured by special heat treating, and with exceptionally keen filing edges. For faster, better filing, insist on "American Swiss" Swiss-Pattern Files.

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SWISS PATTERN FILES

33 years of precision workmanship and reliable service...Sossner's reputation is your guarantee of satisfaction.

High speed, precision ground from solid stock in American National, full or modified Whitworth, and British Association threads.

ALSO: STEEL STAMPS • GAGES • CUTTING TOOLS

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27 Broadway, Lynbrook, N. Y.

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THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

WRITE today for Catalog No. 15

NATIONAL MACHINE TOOL CO.
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"ROCKWELL" HARDNESS TESTER

QUICK DELIVERIES are again possible.

NEW MODELS are enormously improved.

LOWER PRICES in effect since last March due to large rate of production.

Made Only By

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ACROMARK

numbering, stamping and marking machines and accessories are extensively used where fast, accurate permanent work is a prerequisite.

THE ACROMARK CO. ELIZABETH NEW JERSEY

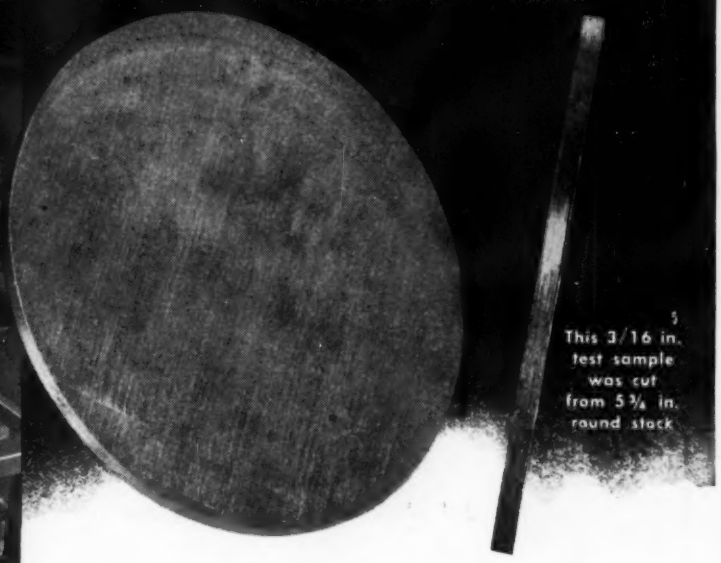
DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

LOOK AT THAT *Smooth* CUT!



This 3/16 in. test sample was cut from 5¾ in. round stock

Note the Straight-Line Cut All Through the Metal!

STRAIGHT as a die and a smoothly cut surface with no hardening or fractures — that's Peerless performance! The test sample illustrated was photographed just as it came from the Peerless Metal Cutting Machine and *has not been retouched.*

Taking as little as ⅛ in. for the cut, Peerless saves critical materials. Cutting 5 to 7 sq. in. per minute in hardened steel, Peerless saves time. And cutting to split-hair tolerances with no bowing or tilting of the saw blade, Peerless Metal Cutting Machines are truly metal cutting precision tools.

Mail the coupon for estimate of cutting time on your toughest operation.

PEERLESS MACHINE COMPANY
1600 Junction Ave. **Racine, Wisconsin**

No Other Metal Cutting Saw Has Such Precise Blade Control

The Peerless Four-Sided Saw-Frame is distortion-proof. It surrounds the blade and the work. The blade is locked rigidly in place. The Backing-Plate Blade-Support permits extreme tensioning with no tilting or bowing. And the Saw-Frame Guide, fitted with eight bearings with renewable and precision-ground ways, assures cutting to the closest possible tolerance with no vibration or variation. Only Peerless offers these exclusive features. Send for descriptive folders.

PEERLESS MACHINE COMPANY, Dept. AM-1043, Racine, Wis.
Mail cutting time estimate for.....

☐ Mail catalog on Hydraulic type Saw for High Production Cutting
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Company.....
Individual.....
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THE ONLY METAL CUTTING SAW WITH FOUR-SIDED SAW-FRAME AND BACKING-PLATE

Fast ACCURATE *Sawing* DEMANDS PEERLESS BLADE CONTROL

AMIC COMPARATOR

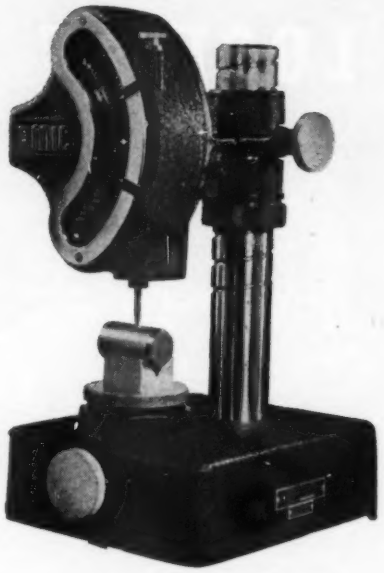
A Precision Indicating Gage

● Designed to replace special gages, flush pin gages, snap, height gages. For accurate, convenient and quick checking of components, either in the tool room or on the production line. Permits precise gaging throughout the whole day without eye fatigue. Each division of the scale represents 1/10,000th of an inch. Interpolations of .00005 easily achieved. Clear readings on 6" scale with inch and millimeter readings. Magnification is 1000. Measuring capacity ± .003 and ± .05 mm.

Accessories

● Note our improved list of accessories designed to suit your particular measuring problems. Thread measuring device, serrated anvil, vee-blocks, centering fixture, ball anvil and several types of backstops.

Manufacturers of
Gages, Jigs, Fixtures, Service Tools and Precision Units



Our extensive experience will solve your measuring problems

AMERICAN MEASURING INSTRUMENTS CORP.
240 WEST 40th ST., NEW YORK, N. Y. Phone: PEnnsylvania 6-0687

Stuart's Thred Kut SOLVOL "Super-Kool" CODOL

Begin with the finest cutting Fluids...

THEN APPLY THEM PROPERLY . . .

● Anything less than the best cutting fluids available is a handicap to your production. Equally important is *proper application.* Stuart Oil Products and Stuart Oil Engineering will give all the advantages it is possible to get from cutting fluids.

For All Cutting Fluid Problems

D. A. STUART OIL CO.
Chicago, U. S. A. • LIMITED • Est. 1865
Warehouses in Principal Metal Working Centers

PRODUCTION BOOSTERS

These Magnetic-V-Blocks are engineered for fast precision production. Holds your work firmly without slipping. Helps increase operation efficiency. Soon pays big dividends on your investment. Write today for descriptive circular.

FRANK McMAHON CO.
142 SOUTH JUNE STREET DAYTON, 3 OHIO

Famous for

- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 190, July 22, '43 American Machinist

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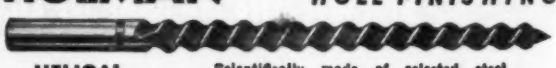
HOLMAN *BETTER, FASTER HOLE FINISHING*



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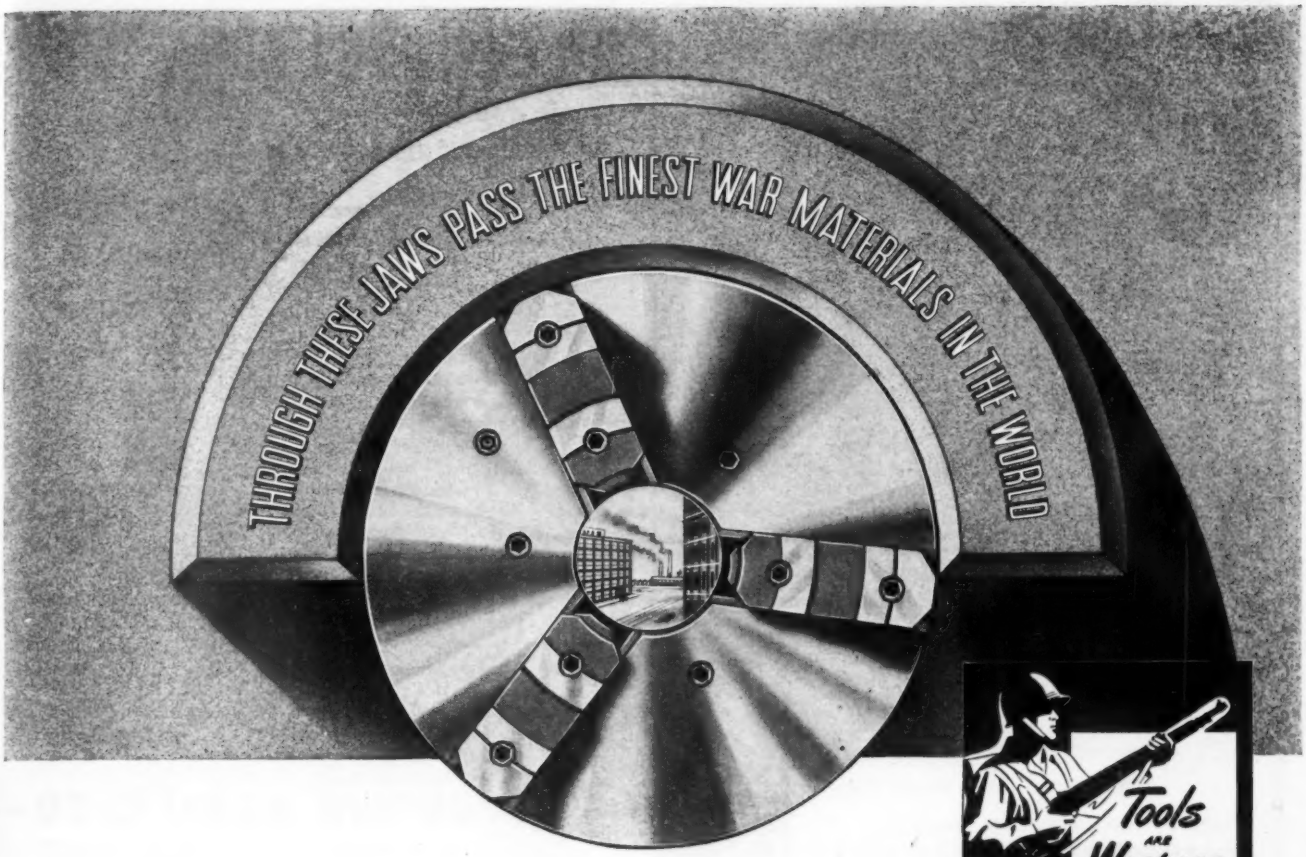
Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.



KEEP it coming . . .
by CAREFUL MAINTENANCE

THERE is really no need for us to emphasize the part that chucks play in war production. But there is a need for us . . . and for you . . . to urge every machine tool operator, and especially those who are not "old hands", to take excellent care of chucking equipment these days. A great deal of precious skilled labor and a lot of critical material goes into the manufacture of a Cushman Chuck. As it comes into your shop, it is a fine precision tool with a long potential service life. But it needs periodical lubrication. It should be kept clean and the precision bearing surfaces free from abrasive particles. It must be accurately and carefully mounted on its spindle. And it should not be overloaded. Chucks are tools and tools are weapons . . . treat 'em right.

★ ★ ★ ★ ★

To help you, we can supply convenient CHUCK-CHECK maintenance cards to be given to your operators. Just let us know how many you need. The Cushman Chuck Company, Hartford 1, Conn.

CUSHMAN

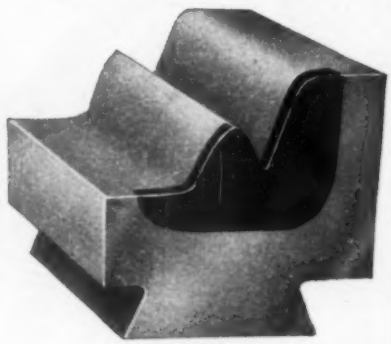
A World Standard for PRECISION

On Many Kinds of Metal Cutting Operations

MIDWEST CEMENTED CARBIDE TIPPED TOOLS

OFFER YOU MORE PRODUCTION ON THE BASIS OF FASTER CUTTING SPEEDS AND SUSTAINED ACCURACY

Staggered Tooth Side Mill



Dovetail Form Tool

Send in a description of your job or problem; Midwest experienced engineers and extensive designing department will assist you on the correct selection, application and use of these and other Precision Metal Cutting Tools designed and manufactured by Midwest over a period of more than 30 years.

MIDWEST TOOL & MFG. CO.
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MILLING CUTTERS • SLEEVES • COUNTERBORES • END MILLS • REAMERS • SPECIAL TOOLS • FORM TOOLS
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

GREENFIELD NO. 4

Plain and Universal

CUTTER and REAMER GRINDER

Handles almost any grinding job within its capacity.

This machine is made in both Plain and Universal Types and can be furnished with a wide variety of attachments.

When supplied as a Universal Type, Cylindrical and Internal Grinding Attachments, together with a 4" Universal Scroll Chuck are included. Maximum capacity for cylindrical grinding is 4" dia. by 15" long.

Internal Grinding Attachment will handle work up to 4" diam., minus wall thickness of piece.

Optional extra equipment available includes Twist Drill Grinding Attachment, Radius Truing Attachment, Universal Cutter Holder and Spiral Tooth Rest Attachment.

CONDENSED SPECIFICATIONS

Swing over Table—8½"
Table—5½" x 28"
Will grind on centers—8½"
Spindle Speeds—2900 and 4200 R.P.M.
Internal Spindle Speed — 13,000 R.P.M.

Send for 3-page Bulletin No. 2 giving complete details.

—PRODUCTION MACHINE CO.—

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

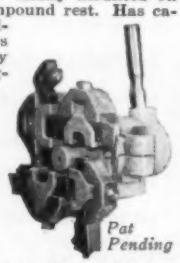
GREENFIELD, MASS., U. S. A.

DON'T WAIT FOR TURRET LATHES

Convert any engine lathe into a turret lathe in 15 seconds with JEFFERSON TURRET ATTACHMENTS. To fit bench lathes and lathes up to 24" swing.

● This new modern TOOL-POST TURRET (below, right), made in 2 sizes, designed to increase production on engine lathes. Easily mounted on cross slide or compound rest. Has capacity of 4 standard tool nolders which are easily inserted and rigidly held.

6 Days' Delivery



Pat Pending

4-Tool Tool-Post Turret

● Then there's the completely modernized 5-tool TAIL-STOCK TURRET (below, right), made in 4 sizes to fit small bench lathes and lathes up to 24" swing. Also the adjustable PULL-FEED LEVER. Jefferson Turrets are real production tools—substantial, rigid, accurate. They must not be confused with the small make-shift gadgets now on the market.

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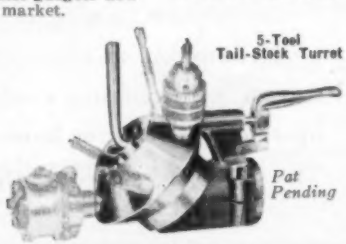


5-Tool Tail-Stock Turret

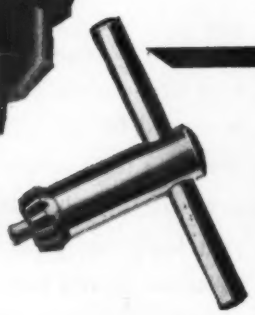
Pat Pending

The Jefferson Bull-Dog Precision Milling Machine. Obtainable Power or Hand Feed.

● ALSO—*Milling Machine Dividing Heads, Vises, Belt Sanders, Swing Frame Grinders, Gyratory Foundry Riddles.*

JEFFERSON MACHINE TOOL CO

Almond Drill Chuck



The Pioneer

Almond Three-Jaw Drill Chucks were Pioneers in their field — the first to be placed on the market. They have formed a necessary part in the logical procedure of machine developments over the past seventy and more years.

Almond Drill Chucks are made in types and sizes to fit all machine tools and portable drills.

Write for complete details.

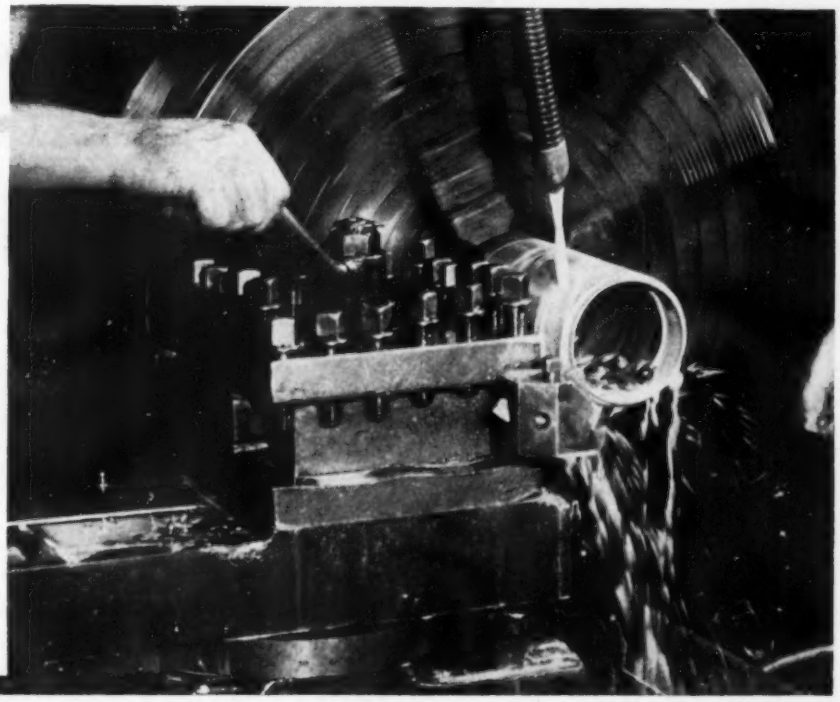
T. R. ALMOND MFG. CO.

ASHBURNHAM, MASS., U. S. A.

The Original Manufacturers of Drill Chucks

Official U. S. Army Signal Corps Photograph

BATTLE ACTION "over there" needs all-out production here. To maintain full output in *MACHINING* operations use . . .



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Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.

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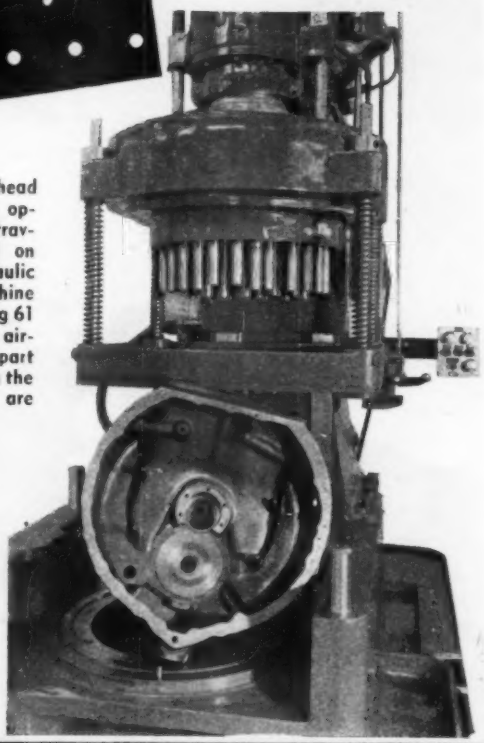
FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY (INC.), 630 FIFTH AVENUE, NEW YORK 20, N. Y.

61 HOLES DRILLED IN *Supercharger* REAR COVER IN 32½ SECONDS . . .

★ Material SAE-4140-Brinnell 241-285 — 50 feet per minute. Longest operation — 21/64 drill — 2" deep — 611 r. p. m. .006 feed — 32½ seconds.

No shifting of jig for each hole — no feeding of machine for each individual hole — but one pass necessary and drilling of all 61 holes is finished.

Special auxiliary head and hydraulically operated in and out travel table mounted on H-4 Hydram Hydraulic Feed Drilling Machine equipped for drilling 61 holes in customer's aircraft parts. Note part and flange in which the group of holes are drilled.



The special Hoefer auxiliary head illustrated is only one of many types available. The work shown is but typical. Any number of spindles up to the capacity of your machine is available. Other heads will drill, tap, ream, countersink, chamfer, or bore holes in a straight line. They also have adjustable centers for various sizes of work. Hoefer heads increase production from the same floor space, decrease handling time, and lessen operator fatigue.

Write us regarding your drilling problems. Our wide experience can be of immediate value to you. If you have a multiple hole drilling requirement we not only have the modern answer but a cost-saving one as well.

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ACCURACY • HIGH SPEED • HEAVY DUTY

A. Very large, for pipe or tubing work
B. Extra long point used in facing operation
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D. Standard point
E. Blank made of soft tool steel for nests
F. Female for work not having centers

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Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

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Quickly exposes faulty or torn threads, cracks, burrs, scratches, etc., not apparent to the naked eye.

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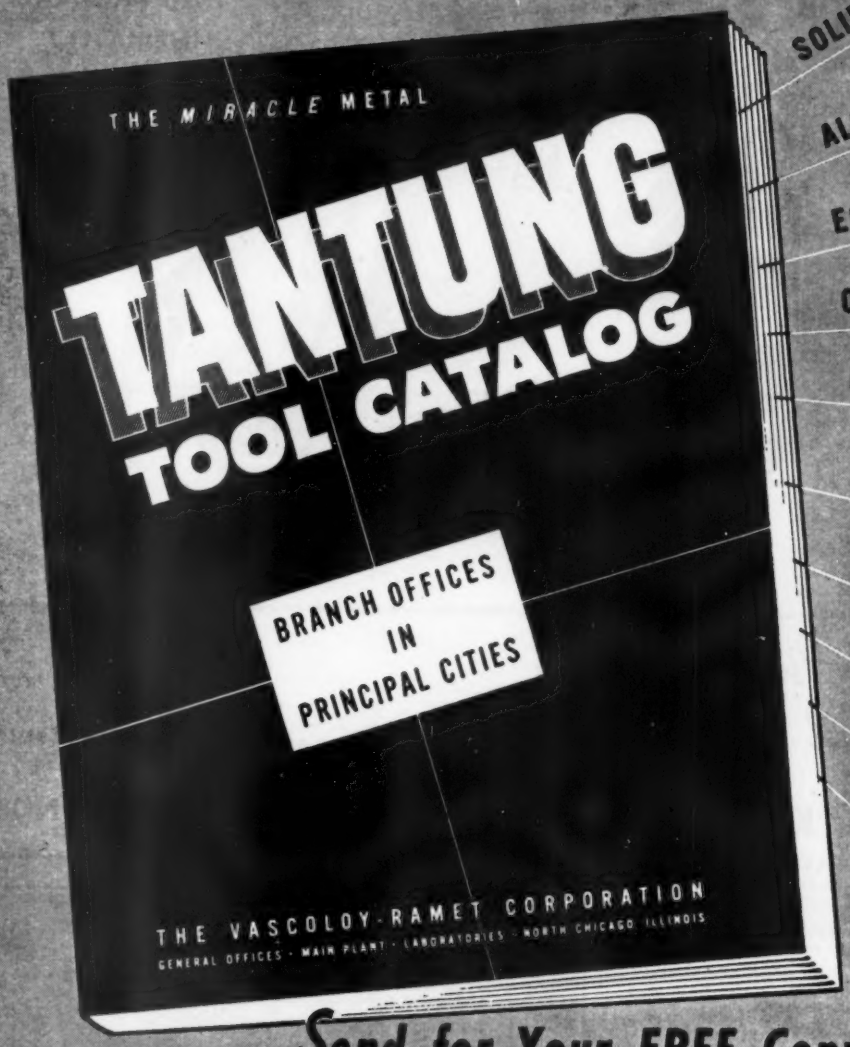

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Quick opening and return are combined with tremendous binding force in the "HARTFORD" Milling Vise, all operations of which are handled by two easily manipulated levers.

By releasing the upper eccentric binding lever and moving the lower cam lever a quarter turn, the movable jaw is opened 7/8" for quick clearance of chips or release of work.

Unique design and rugged construction insure positive jaw alignment. Movable jaw is drop forged, heat treated and ground on all fitting surfaces.

Made in Plain and Swivel Jaw types. Width of jaw 5"; depth of jaw 1 3/16". Jaw openings: 2 5/8" (plain type); 2 1/4" (swivel type).

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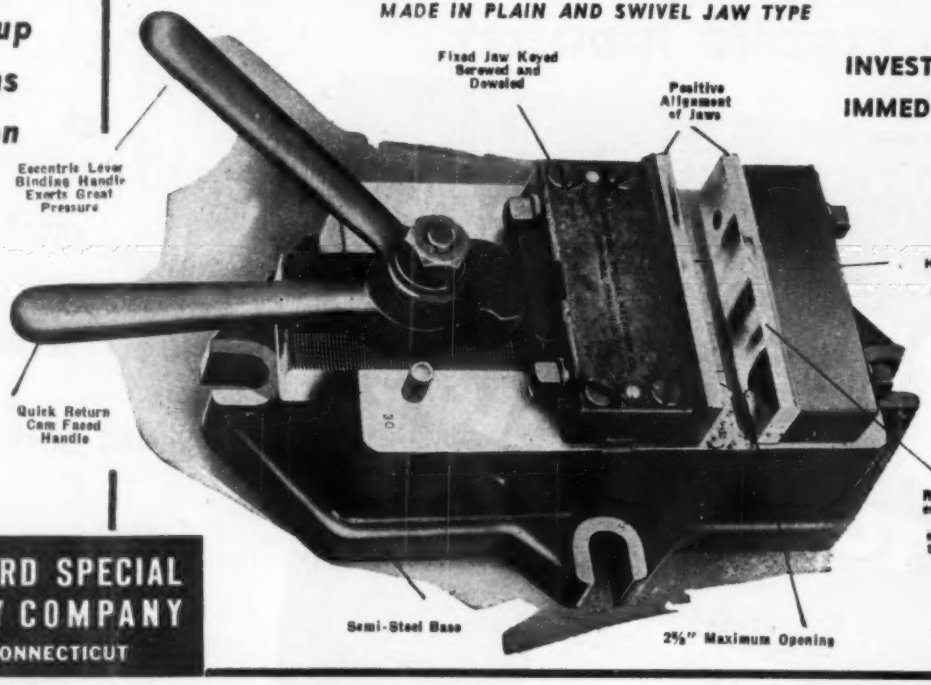
MADE IN PLAIN AND SWIVEL JAW TYPE


Fixed Jaw Keyed Screwed and Doweled
Positive Alignment of Jaws
Eccentric Lever Binding Handle Exerts Great Pressure
Movable Jaw Drop Forged Heat Treated and Ground on all Fitting Surfaces
Quick Return Cam Faced Handle
Removable Hardened and Ground Jaws, Interchangeable with those of No. 2B and 8. Vise
Semi-Steel Base
2 5/8" Maximum Opening

Jaw width—5"
Jaw depth—1 3/16"
Max. opening
(Plain Jaw)
Jaws in place—2 5/8"
Jaws removed—3 1/2"
Max. opening
(Swivel Jaw)
Jaws in place—2 1/4"
Weight 40 ℔
Length—13"
Width—8"
Height—5"

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Your FAVORITE Reversible Ratchet Wrench never slips off, battering the nut or barking your knuckles. No lost motion, no lift-off at the quarter turn. Tighter grip, positive, straight-ahead action, and balanced weight. Your benefits . . . speedier work, less fatigue.

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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

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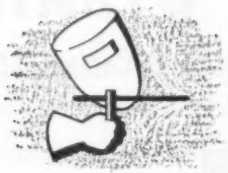
PAGE *Welding* ELECTRODES



Of course **PAGE** developed a new electrode for welding armor . . . Important as that may have been to tank production, it is just as vital—to those who weld Stainless Steel—that **PAGE** also developed a *complete* range of electrodes for this purpose. In fact, no matter what Stainless Steel you are welding, **PAGE** can supply you with electrodes that deposit, in the weld, metal that equals the Stainless you are using. That is something worth checking into with **PAGE.**

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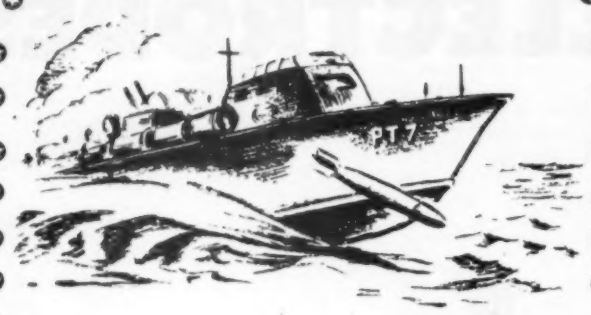

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For general purpose marking this Noblewest Model No. 4 has no peer. Today it is widely used by war industries for: 1) marking round surfaces, 2) marking flat surfaces, 3) precision graduating, 4) automatic serial numbering. Employing the famed Noblewest rolling process, it provides faster, better marking at lower cost. Can be furnished with either manual foot-lever or pneumatic pressure operation. Occupies a floor space of only 18" x 20". Complete information gladly furnished.

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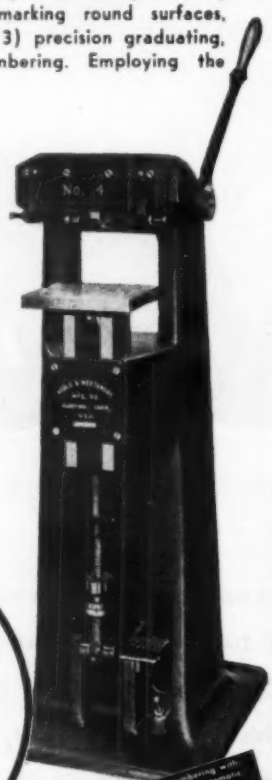

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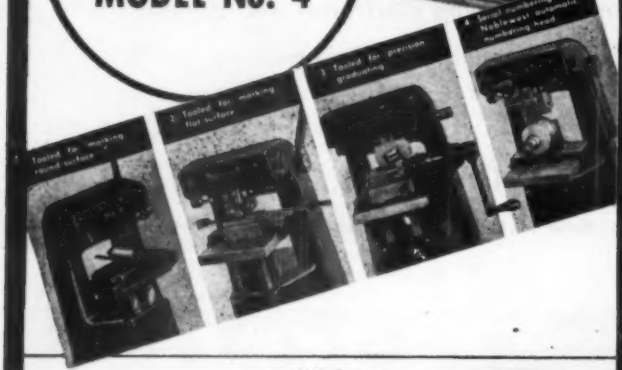
GENERAL PURPOSE
MODEL No. 4



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The Inexpensive Efficient Coolant Strainer

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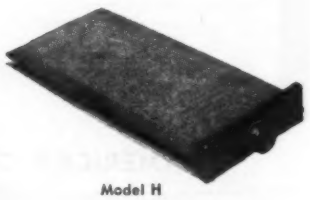
Model C

MODEL C, cylindrical type coolant strainer is the size adaptable to most machines. Strains chips and slag from coolant. Protects pumps, gears. Prevents excessive machine wear and defective workmanship due to scoring, etc. Easily installed. Diameter 5". Overall height 4-5/32". Capacity to 10 G.P.M.—¾" pipe.

MODEL H is designed particularly for grinders and automatic screw machines, yet works efficiently in all machines. Especially adapted to machines with shallow or narrow sumps. Removes fine residue (grindings, lint, etc.) from coolant.



Model H

Write for detailed information

METAL TEXTILE CORPORATION
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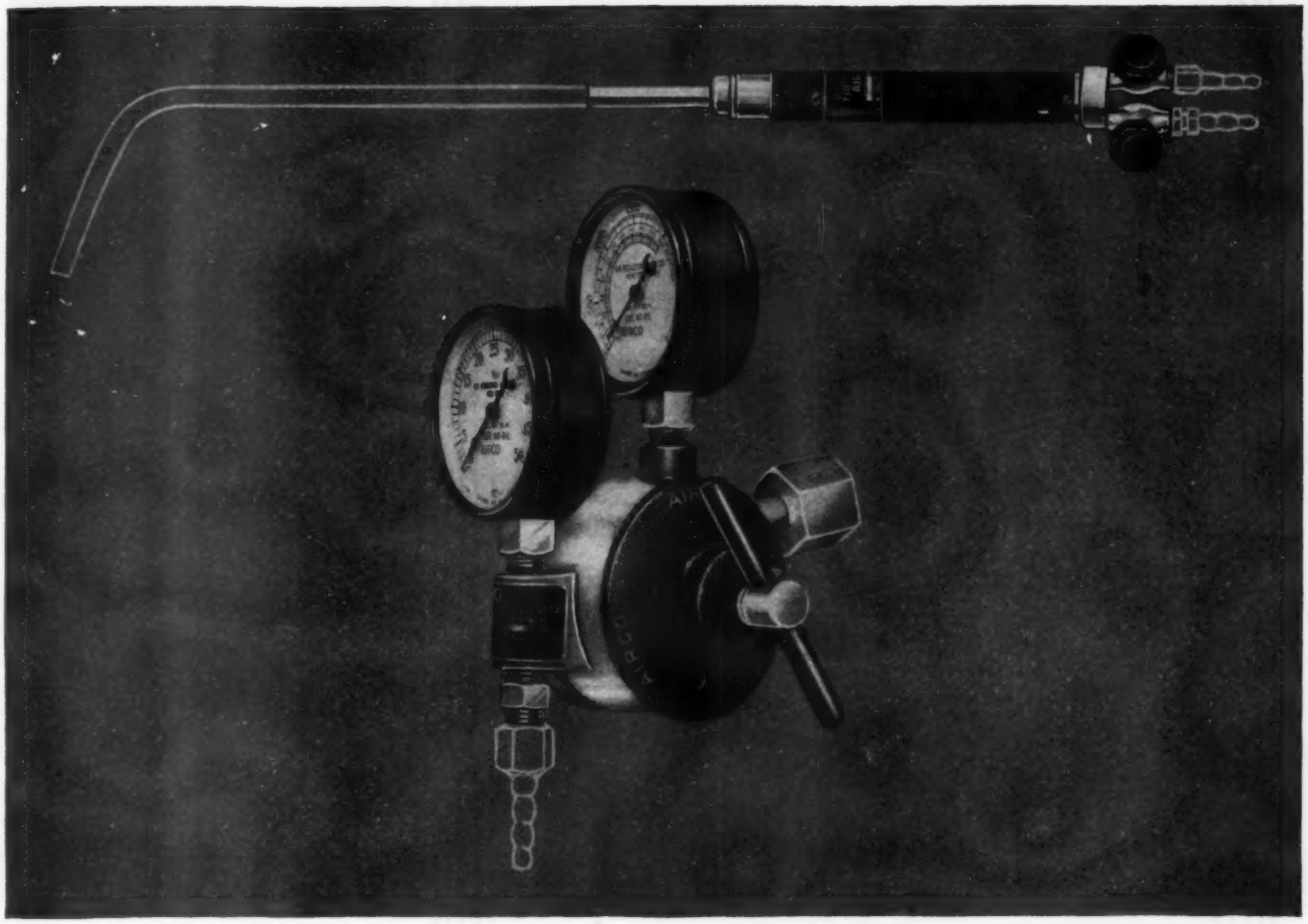
A *Change* IN APPEARANCE



. . . BUT NONE IN PERFORMANCE

To conserve copper, copper base alloys and stainless steel, some component parts of Airco torches and regulators are now made of less critical materials. The dark areas in the above illustration indicate the parts affected by this change. All these parts are treated with a special coating for maximum protection against corrosion.

In all other respects, Airco torches and regulators are unchanged.

★ ★ ★

The parts shown in white outline above will no longer be furnished automatically with torches or regulators. This also is done for the purpose of conserving critical materials.

Purchasers desiring hose connections should therefore be sure to include them specifically when ordering torches or regulators. The same should be done with tips when ordering torches—in this case mentioning the size or sizes of the tips required.

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• The abrasives are suspended in a special grease composition paste base that becomes an oily film under pressure of lapping. This base was developed expressly for hand, plate and machine lapping.

For dilution or extra lubrication mix with small quantity of thin film oils such as kerosene, spindle.

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Above packed in 10½ and 52 lb. cans

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Crystolon ..... 75¢ per lb.
TM. Reg. U. S. Patent Office (silicon carbide)

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(high reflective finish on steel)
Packed in 8½ and 42 lb. cans
Large Glass Jars, all Grades ..... $1.00 each

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A substitute for sperm oil on lapping operations.

Single gallon can ..... $2.00 per gal.
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Also many other compounds: Valve Grinding, Gear Lapping, Ball Bearing Raceways, Finishing, Polishing—All Types. Write us for samples.

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Ready WHEN NEEDED

"Hallowell" Work-Benches are available for use in machine shops, factories, power plants, mills and wherever else they are needed, because the more than 1300 ready-made combinations make them adaptable to all purposes. They are of rigid construction, with flanged legs that permit them to stand firm and steady without costly bolting to the floor.

Also included in the "Hallowell" line are foremen's work-stands, tote and storing boxes, tool stands, stools, floor trucks, and many other needed items. Let us give you the advantage of our experience in supplying shops and plants with "Hallowell" Shop Equipment. Just write and tell us your needs and we will gladly send you our recommendations.

For the duration "Hallowell" Shop Equipment can be supplied of wood construction where priority restrictions do not permit the use of our famous steel equipment.

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JENKINTOWN, PENNA. BOX 4

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Fig. 928
"Hallowell" Work-Bench with laminated wood top. Drawer is extra. Pat'd and Pat's. pending.

"Hallowell" Foreman's Work-Stand. A safe place to keep records, etc., under lock and key. Shipped knocked down. Patented and Patents Pending.

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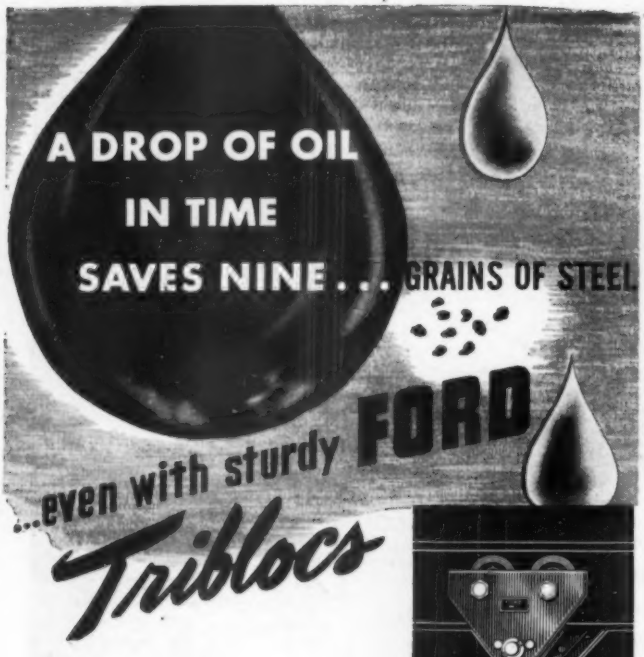

...even with sturdy FORD *Triblocs*

This is no time to let machinery run dry. Proper maintenance means proper lubrication. Yes, lubrication is an all-important factor in making present equipment last longer. So, here are just a few suggestions for keeping your **FORD TRIBLOCS** in efficient working order:

- Gear case cover should be removed occasionally and a small quantity of heavy graphite grease applied to gear chain.
- Load chain should be cleaned and lubricated frequently with a heavy oil. A lubricated chain will far outlast a dry chain.
- Load sheaves should also be greased.
- Oil bearings frequently to avoid needless and excessive wear.
- Oil holes are provided in the **TRIBLOC** at vital points. These should be used frequently.

When given intelligent care, including frequent cleaning and lubrication, **FORD TRIBLOCS** will give you many long years of efficient work. Take care of them.

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BEFORE $5593.60
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Any unskilled person can operate an American Chip Wringer.

Write TODAY for full particulars.

American Chip Wringers are available in following models:

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Model 26
Model 30
Model 40
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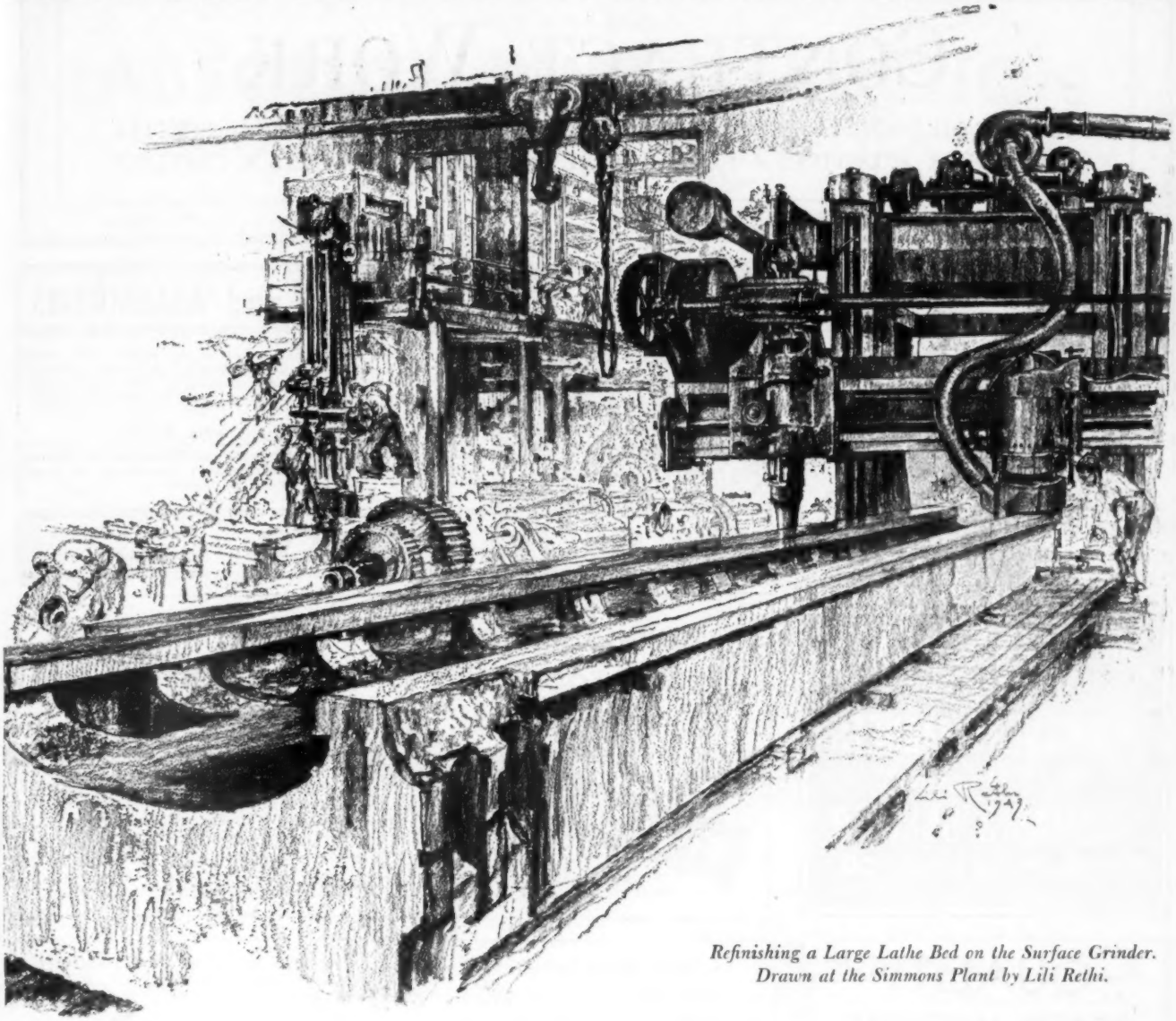
CINCINNATI PLANT

The AMERICAN LAUNDRY MACHINERY COMPANY
CINCINNATI 12, OHIO

FOUNTAIN OF YOUTH FOR A MACHINE AGE



Refinishing a Large Lathe Bed on the Surface Grinder. Drawn at the Simmons Plant by Lili Rethi.

PONCE DE LEON came to the New World seeking a Fountain of Youth for the human race. He never found it. Medical science may yet.

In this same New World the machine has been developed to its maximum achievement. Mass production of commodities with the highest standards of precision is the American hallmark. The world's largest users of the products made from machine tools, the American people as a whole only now realize what they are, their significance in a world at war, and the peculiar difficulties involved in their manufacture; namely, that while machine tools make mass production possible, they cannot, in turn, be mass-produced. They are our master tools.

Machine tools, too, have a span of life, but for them engineers have created a unique Fountain of Youth... the Simmons plant for Engineered Rebuilding. Here machine tools of all types, sizes and ages throw off their years, return to work rejuvenated. The treatment: dismantling to the bare casting, all surfaces refinished by either grinding, planing or hand-scraping; all worn parts, such as gears, bushings and shafts, replaced with new; the machine then re-assembled along the same lines as followed by the original manufacturer and tested under power.

SIMMONS MACHINE TOOL CORPORATION
1759 North Broadway, Albany 1, N. Y.

SIMMONS *Engineered* REBUILDING

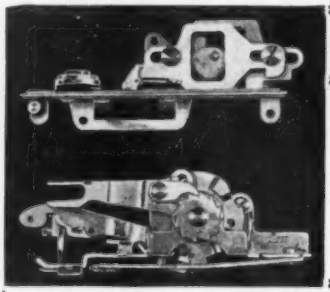
CONTRACT WORK

TOOLS • DIES • JIGS • FIXTURES • MOLDS • STAMPINGS • FORGINGS • SPECIAL MACHINERY • DEVICES • PARTS • SCREW MACHINE PRODUCTS • CASTINGS

ADDITIONAL FACILITIES FOR CONTRACT MANUFACTURING

Hand screw machines up to 1½ dia.
Turret lathes up to 15" dia.
Milling machines
Engine lathes
Bench lathes
Drill presses
DoAll contour cutting machine

RELIANCE MACHINE & MFG. CO.
30 Irving Place, New York, N. Y.
established 1922



STAMPINGS and ASSEMBLIES

We can make long or short runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. Our manufacturing facilities also include screw machine products, tools, dies, jigs and fixtures.

"Greater Savings with Greist"

Your order is assured of quality workmanship by skilled mechanics. We will furnish prompt quotations on your blueprints or samples. Write us today!

THE GREIST MFG. CO. 546 Blake Street New Haven, Conn.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

MACHINES AND PARTS, SPECIAL TOOLS, ETC.
to your specifications

SPECIAL ENGINEERING WORK

. . . on Contract

It will pay you to investigate our facilities. As designers and builders of wire and ribbon stock forming machines we can offer you skilled and experienced assistance. Send us your blueprints or samples for prompt quotations.

We also solicit your bids for cam milling
THE A. H. NILSON MACHINE CO. Bridgeport, Conn.

QUALITY
SCREW MACHINE PRODUCTS
• ● •
WALTHAM
SCREW COMPANY
WALTHAM • MASS.

• TOOL DESIGNING AND BUILDING • MACHINES DESIGNED • IDEAS DEVELOPED • PROMPT—EFFICIENT—SERVICE • • REASONABLE CHARGES •

OLD COLONY ENGINEERING CO.
180 Weeden St. • Pawtucket, R. I.
P.O. Box 672 • Tel. Blackstone 2610
Write — Phone or Telegraph

Gray Iron and Semi Steel Castings, also alloyed with nickel, chrome, and molybdenum. Wood, Iron, Brass and Aluminum pattern work.

KING FOUNDRIES, INC.
Phone 823 North Wales, Montg. Co., Pa.
22 Miles from Philadelphia, Pennsylvania

DESIGN & BUILD JIGS, FIXTURES & GAGES
REED MACHINE & TOOL ENG.
BOX 662
PAWTUCKET, R. I.

WIRE AND METAL SPECIALISTS
In round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

MACHINE SHOP WANTS DEFENSE WORK
Lathes, Milling Machines, Drill Presses, Riveting, Hot Dip Tinning, Jigs and Fixtures. Investigate TODAY.
STEPHEN J. LEWIS ENGINEERING CO.
215 Butler St. TRiangle 5-5348 Brooklyn, N. Y.

MACHINE SHOP
Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8" x 8" Shaper. The usual line of hand tools and equipment plus experienced workmanship assure your satisfaction. Your inquiries invited.
C. VANDEGRIFT CO., HOCKESSIN, DELA.

CENTERLESS GRINDING
Straight, Cylindrical, Shoulder, Profile, and Multiple Diameters . . . Ground Taper Pins
Screw Machine Products. Heat treated and ground if necessary. Improved and expanded facilities insure prompt and accurate service.
Send blueprints or samples for estimates.
PORTER MACHINE CO.
3139 Enyart Ave. Oakley, Cincinnati, Ohio

Our New Enlarged Plant Has Open Time for Your Grinding Needs
CYLINDRICAL AND SURFACE GRINDING
Immediate Delivery
We Will Quote You Upon Request
ACME EQUIPMENT CO.
126-8 S. CLINTON ST., CHICAGO, ILLINOIS

By Order of the AMERICAN ARMAMENT CORPORATION

WE WILL SELL AT

ABSOLUTE PUBLIC AUCTION

100 DESIRABLE MACHINE TOOLS

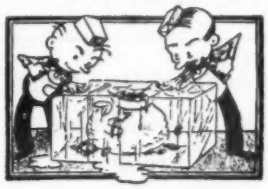
MANY EQUAL TO NEW

Located for convenience of sale at 428 NORTH 15th STREET, ALLENTOWN, PA. where sale will start on

TUESDAY, NOVEMBER 9th, 1943 promptly at 11 a. m.

From there, the Sale will proceed immediately to: THE MOTOR RAMP GARAGE—517 COURT ST. ALLENTOWN, PA.

We Liquidate Your Frozen Assets



LATHES

27"x12' **Lodge & Shipley**, single back gear, Q.C.G., with Turner drive and motor.

26"x10' **Wolcott**, dbl. back gear, Q.C.G., with Turner drive and motor.

24"x14' Draper, dbl. back gear, with Drive-all gear box and motor.

3—**24"x14' Reed, 8 speed, geared head, Q.C.G., taper attach., d.m.d. with motor.**

24"x8' **American**, sgle. back gear, Q.C.G., complete with drive-all gear box and motor.

22"x12' Hamilton, loose change gear, Turner dr. with motor.

20"x14' **LeBlond**, sgle. back gear, Q.C.G., with Turner drive and motor.

20"x10' **Lodge & Shipley**, Q.C.G., with Turner drive and motor.

18"x12' **Greaves Klusman**, Q.C.G., taper attach., Western gear box with motor.

18"x6' Reed, single back gear, with Turner drive and motor.

18"x6' LeBlond, sgle. back gear, with Turner drive and motor.

18"x8' **Monarch**, dbl. back gear, Q.C.G., with Turner drive and motor.

17"x8' **Champion**, sgle. back gear, Q.C.G., with Turner drive and motor.

16"x8' **LeBlond**, single back gear, Q.C.G., with Turner drive and motor.

16"x8' **Pratt & Whitney, geared head, Q.C.G., single pulley drive with motor.**

16"x6' **Monarch**, dbl. back gear, Q.C.G., with Turner gear box and motor.

15"x6' Blaisdell, single back gear with motor bracket and motor.

15"x6' South Bend, single back gear, with Turner drive and motor.

14"x6' Prentice, single back gear, with Turner gear box and motor.

14"x6' Prentice, single back gear, with Turner drive and motor.

2—14"x6' Monarch, dbl. back gear, with Turner drive and motor.

14"x6' Worcester, sgle. back gear, complete with motor.

13"x6' Blaisdell, single back gear, with Turner drive and motor.

TURRET LATHES

No. 3A Warner & Swasey, 12 spd. head, 3¼" spdl. capacity, sgl. pulley drive with motor.

2—**No. 4 Warner & Swasey, back geared, friction head, power feed to turret, with pump and drive-all gear box with motor.**

2—**No. 2 Warner & Swasey**, plain head with pump, Turner drive and motor.

3¼"x36" Acme Universal, 9 speed, geared head, single pulley drive with motor.

No. 7 Foster, geared, friction head, power feeds, Turner drive and motor.

No. 7 Foster, universal, geared, friction head, power feeds to turret and carriage, Turner drive and motor.

No. 4 Brown & Sharpe, power feed to turret, equipped with Turner gear box and motor.

No. 2 Bardons & Oliver, back geared, friction head, with pump. Cullman drive and motor.

18" Gisholt, 3½" spindle capacity, Taper attach., silent chain drive with motor.

3—24" Gisholt, 6" spindle capacity, Taper attach., drive-all gear box with motor.

No. 32½ Garvin, 1½" spindle capacity, bar feed, with pump and motor.

No. 2½ Garvin, back geared, friction head, 1½" spindle capacity, power feed to turret, Turner drive and motor.

Garvin, back geared, friction head, 1½" spindle capacity, drive-all gear box and motor.

No. 2 Wood, back geared, friction head, 1" spindle capacity, with Turner drive and motor.

AUTOMATICS

3—1⅝"x7" New Britain, 6 spdle., regular tooling, arranged for belt drive with motor.

3—1"x5" New Britain, 6 spdle., regular tooling, pump, Tex-rope drive and motor.

3—No. 00 Brown & Sharpe Cut-Off Machines, with regular tooling, Turner drives, m.d.

DRILLS

25" Snyder, back geared, sliding head, power feeds, taper attach., d.m.d. with motor.

25" American, back geared, sliding head, with motor.

24" Rockford, sliding head, power feeds, taper attach., Tex-rope drive with motor.

20" Barnes, back geared, power feeds.

3—Henry & Wright, 4 spindle, 12" overhang, ball bearing.

2—Henry & Wright, 2 spindle, 7" overhang, ball bearing with motor.

3—Delta Bench Drills, 11" overhang, with motors.

TAPPING MACHINES

2—No. 2 B.G. Garvin, complete with drive-all gear box and motor.

MISCELLANEOUS

36" Bridgeport Vertical Boring Mill, one head on cross rail, spur geared drive, Turner gear box with motor.

Gooley & Edlund Miller, 14"x54" table, Turner gear box with motor.

Burr Automatic Horizontal Keyseat Milling Machine, 6"x36" table, power feeds to table, motor driven.

PRACTICALLY NEW IN AGE AND CONDITION!

4L LaPointe Hydraulic Broaching Machine, with variable delivery pump, arr. for direct drive, hardened steel ways, normal pulling capacity 73,000 lbs., peak pulling capacity 97,000 lbs., arranged for motor drive.

W. F. & J. Barnes Horizontal Honing Machine, 14' stroke, hydraulic hone expander, arr. for motor drive with motors.

No. 420 W. F. & J. Barnes 2-spindle Deep Hole Drilling and Boring Machine, 120" stroke, 2 chucks, d.m.d. with motor.

No. 3 LeBlond Rifling Machine, rifling travel 72", power rapid traverse to rifling carriage, Coolant system, with 4 to 1 variable speed D.C. motor.

Webster Tallmadge Gun Barrel Drilling or Boring Machine, drilling or boring capacity 100" long, spindle equipped with two 18" chucks, variable speed motor driven with motor.

EVERYTHNG WILL BE SOLD IN PIECEMEAL LOTS. MACHINES NOW AVAILABLE FOR INSPECTON.

See Representative at Motor Ramp Garage.

A COMPLETE DETAILED ILLUSTRATED CIRCULAR WILL BE SENT YOU FREE ON REQUEST.

FOR ALL INFORMATION . . . . WRITE, WIRE, PHONE:

SALE UNDER MANAGEMENT OF

Industrial Plants Corporation

Auctioneers, Appraisers, Liquidators

(Ohio Office: Ohio Bldg., Toledo, Ohio.)

90 WEST BROADWAY
NEW YORK CITY
BArclay 7-4185

SEARCHLIGHT SECTION

WANTED
MECHANICAL ENGINEERS (3) FOR POST-WAR PROGRAM

Well known manufacturer of surgical and hospital equipment, in business for nearly 50 years, has openings for three mechanical engineers.

Although this firm is heavily engaged in war production, these positions also involve work on a post-war program, thus offering excellent opportunities to the right men.

Qualifications:

Age—30 to 50 years

Education—Engineering degree desirable but not necessary where practical and varied experience can be emphasized.

Experience—Background of light machine design and/or some acquaintance with electrical heating and electrical controls.

Compensation—To start, $3,500 to $5,000 annually, depending upon qualifications. Pension Plan also. Bonuses have always been given in addition to salary base.

If you are employed in essential war work to the full extent of your skill, do not apply.

Applicants write to—

P-689, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

CARRIER CORPORATION
has an opening for a
TOOL DESIGNER

experienced in Jigs, Fixtures and Special Machines

The Corporation is now engaged 100% in war work and has an active post war program.

A statement of availability is required.

Address reply to—

T. M. COX, JR.
CARRIER CORPORATION
Syracuse, New York

WANTED
HIGH GRADE MACHINE TOOL MAN

Must be thoroughly familiar with all types of machine tools and have proven sales ability. Need not be a graduate engineer. Some traveling likely. Please give complete details in first letter.

Permanent position at very substantial salary to right man. Please do not answer this advertisement unless you meet fully the requirements outlined.

P-687, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED
MECHANICAL ENGINEER

with experience in sheet metal fabrication and machine design. A working knowledge of dies, as well as experience in the designing and construction of jigs and fixtures is essential. Must be capable of assuming the responsibility for the designing of new machinery and for manufacturing methods in an aggressive manufacturing organization. Will be employed at highest skill now, but the right man with an eye on unusual opportunity and permanency after the war is what we're really looking for. In reply state all essential facts required for prompt action.

P-686, American Machinist
330 W. 42nd St., New York 18, N. Y.

WANTED
First Class Engineer

with practical experience in Machine Tool Design. One who has something to offer for the Post War Trade and with Horizontal Boring Machine experience preferred.

P-674, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

MECHANICAL DRAFTSMAN with practical mechanical experience in blanking, drawing and forming dies for sheet aluminum products in defense work by old established company in Central West; give experience and full particulars. P-667, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL MAKERS for defense plant in Central West; give experience and full particulars. P-668, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MACHINE DESIGNER WANTED—Experienced on the design of special machinery and machine tools. This is an excellent opportunity for a first class man interested in a steady position in New England. Only men 35-55 with a record of successful achievements will be considered. In replying furnish complete information preliminary to a conveniently arranged interview. P-685, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ENGINEER WANTED to take charge of methods department for machinery manufacturer in Portland, Oregon, now in war work but manufacturing same product as during peace time. Must have had experience in time studies, motion studies, engineering of methods, establishing wage incentive systems, etc. Reply should give full details of education, experience, age, etc. P-690, American Machinist, 68 Post Street, San Francisco 4, Cal.

MAN WANTED with manufacturing experience and sales ability to take charge of office in East or Middle West and have responsibilty for securing materials and placing sub-contracts for a Pacific Coast Company. State education and experience in first letter. P-691, American Machinist, 68 Post Street, San Francisco 4, Cal.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 33 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 266 Delaware Bldg., Buffalo, N. Y.

POSITION WANTED

MANUFACTURING EXECUTIVE—Plant Manager — General Superintendent. Technically trained mechanical engineer and industrial manager. 12 years managing plants in charge of personnel, cost accounting, production engineering, production control, plant engineering and inspection. 22 years manufacturing experience in—heavy machinery, precision machine tools, high quality diesel and aviation specialties. Inherently mechanical. Successful records for high production and low costs through—time-study, performance standards, standardized tooling and methods, incentive systems. Good on labor relations. Salary $7,000. 42 years old. Immediately available. PW-671, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED

ADDITIONAL LINES wanted by well established Manufacturers Agent with fifteen years successful experience and extensive and valuable list of customers and their mechanical men and buyers. Exclusive sale of light machinery and tools of exceptional merit desired. Territory covered by our practical Tool Service men, Southern Michigan and Northwestern Ohio. RA-692, American Machinist, 68 Post Street, San Francisco 4, Cal.

A MANUFACTURERS AGENT located in Chicago seeks one additional line offering good post war possibilities. Well established in the Illinois trade area with an enviable sales record in the cutting tool field. A graduate Engineer, competent and experienced in technical service and sales. RA-693, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SALESMAN WANTED

SMALL TOOL SALES AGENT or agency wanted to handle adjustable limit snap gages. Liberal commission, and exclusive territory. Refer to SW-683, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N. W., Washington, D. C.

CONTRACT WORK

WORK WANTED—For advertisements of work wanted see page 246.

WANTED
DISTRIBUTORS AND SALESMEN

COMPLETE LINE OF INDUSTRIAL DIAMOND TOOLS.

RW-688, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED ADDITIONAL LINES
Established Representation for Your Product

Old established agency, well known in Chicago territory, desires to handle exclusively additional lines of production precision metal cutting tools and related equipment.

RA-678, AMERICAN MACHINIST
520 No. Michigan Ave., Chicago, Ill.

SALES REPRESENTATION FOR TECHNICAL PRODUCTS

Our resident engineering sales representatives including many professional engineers, with offices in 37 cities, enjoy long established contacts in the industrial and utility fields. They represent products of well established companies and can also arrange local warehousing and supervise maintenance if required. We finance ourselves. Straight commission basis. No salaries, no advances, no expenses. The risk is ours. If we like your product, we may take on your weakest territory. Address our Mr. Edmonson.

EISEMANN INDUSTRIAL CORPORATION
Manufacturers Trust Bldg.
Columbus Circle, N. Y. 23, N. Y.

Manufacturers' Attention

We are desirous of obtaining accounts on basis of Manufacturers' Representative for the New England States. We have a good Sales Organization, together with an Engineering Department, and are well financed. Established 12 years.

BERRY STOKER & SERVICE CO.
65 Randolph Street, Arlington, Mass.

NEW INVENTIONS WANTED

Mechanical and electrical devices for post-war manufacture and sale. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

Leading firm of British Engineers with Continental Sales Organisation are prepared to negotiate for

EUROPEAN POST WAR RIGHTS
of manufacturers of
Light and Medium Engineering Units.

Full particulars of confidence to **Messrs. Churchill, Clapham & Co., Solicitors, 1 Broad Street Place, London, E. C. 2.**

IN STOCK!!!

LATHES

Putnam 26" x 12' Heavy Duty Screw Cutting Engine Lathe, QCG.
LeBlond 21 x 10 Quick Change Gear Lathe, motorized.
Reed 22" x 16' Plain Change Lathe, Light Pattern.
Rockford 14 x 6 Quick Change Gear, motorized.
Champion 18" x 12' Quick Change Gear Lathe.
Superior 18" x 8' Heavy Duty Quick Change Gear.
Davis 18" x 10' Plain Change Gear.
LeBlond 14" x 6' Toolroom Quick Change Gear Screw Cutting Lathe, with taper attachment, drawbar collets and two chucks.
Rahn-Mayer 18" x 10' bed Standard Change Gear Screw Cutting Engine Lathe Price: $850.00.

TURRET LATHES

21" Gisholt Universal Turret Lathe with 3¾" hole in spindle, 2-step cne for 5" belt.
Warner & Swasey No. 2 Geared Friction Head Hand Screw Machine. 1" cap.
Warner & Swasey No. 2 Plain Friction Head, Hand Screw Machine, 1" capacity.

FURNACE

1—W. S. Rockwell Revolving Annealing Furnace, Model 701.

HAMMERS

1—1100# Bement & Miles Steam Forging Hammer.
No. 6½ Rochester, High Speed Riveting Hammer.
No. 5½ B Rochester High Speed Riveting Hammer.
High Speed Riveting Hammers—4A, 3A, HD, 2A, HD, 1AA.
50# Fairbanks Blacksmith Power Hammer.

BORING MILLS

24" Bullard Vertical Turret Lathe Rapid Production, motor drive.
3½" Rochester Floor Type Horiz. Boring Mill, M.D.

LOCOMOTIVE CRANE

Ohio Locomotive Crane, 8 wheel, 50' boom. PRICE: $9000.00.

GRINDERS

No. 6 Besley Double Opposed Disc Grinder.
No. 2 and No. 3 Brown & Sharpe Cutter Grinder.
Gorton, double end Disc Grinder, 18" discs.
Greenfield Internal Grinder #12 Hydraulic, motor drive, capacity 15" swing, grinds automatically ⅝ to 5" diameter, 4" deep, equal to new.
36" Blanchard #16 Vertical Rotary Surface Grinder, late model.
Heald 16" Rotary Surface Grinder #255, motorized.
Pratt & Whitney Vertical Surface Grinder 14" x 36', Model B, ball bearing, motor drive.
#2 Brown & Sharpe Universal Cylindrical, belt drive.

BX CABLE COILING MACHINES

No. 1 and No. 2 Sleeper & Hartley BX cable coil. mach., ⅜ and ½ in. cap. Last used for speedometer cable. Complete.

DRILLS

Leland-Gifford 2-spindle, No. 2 M.T., high speed, ball bearing Drill Press, power feed.
Allen single-spindle, high speed, ball bearing, 8" overhang Drill Press, table 14 x 14.
Henry & Wright 6 spdle #2 M.T. High Speed, B.B.
RADIAL DRILL—Bickford 7' arm, 15" round column, gear box motor drive.
Prentice 4-spindle No. 2 M.T. High Speed Ball Bearing Drill, rebuilt.

DRILLING MACHINES

Fox No. 15H mult. spdl. drill. mach. Hyd. feed, 35 No. 1 Morse taper Spindles, 17" x 34" bd., ser. No. 1005, M.D., 10 H.P., 3 ph., 60 cy., 220 v.
Fox No. D31 mult. spindle drill. mach. Drilled for 32 spindles and equip. with 16 No. 2 Morse taper Pwr. fd., 17" x 34" bd. Ser. No. 626, m.d. 10 H.P., 3 ph., 60 cy., 220 v.
Natco No. 12 mult. spindle drill. mach. Single pulley, B.D., Drilled for 16 Spindles and equip. with 6 No. 2 Morse taper. Power feed.

GEAR SHAPERS

2—#612 Fellows—Late type.
1—No. 3 Brown & Sharpe Spur Gear Cutter.
1—No. 13 Brown & Sharpe Spur & Bevel Gear Cutter.

SHAPERS

26" Cincinnati Triple Geared Shaper, Friction Drive.
20" x 20" x 36" N-B-P Shaper-Planer, Arranged Motor Drive.
16" Cincinnati Back Geared, cone drive.

COIL STRAIGHTENERS

No. 5-18½ Littell Single Rack & Pinion Feeding and Straightening Machine takes stock 18½" wide up to 10 gauge.

MILLING MACHINES

Cincinnati #3 Vertical Milling Machine, High Power, Power Rapid Traverse. Motor Drive.
Ohio No. 34 Heavy Universal Milling Machine, M.D
No. 1½ Valley City Plain Miller, belt drive.
PRATT & WHITNEY 2" Spline Duplex Miller.

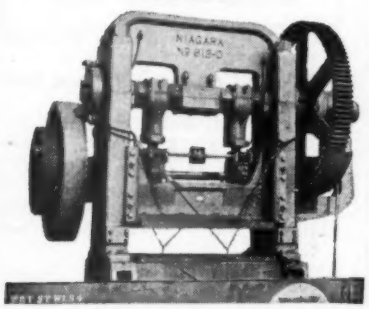
Presses, Brakes and Shears

Marietta Power Press 50 ton, 104 x 20 bed.
Niagara #662 Gap Shear, 60" x 3/16.
Bertsch Shear, 72" x 3/16.
Niagara #208 Circle Shear and Flanger.
No. 132 Bliss 14 ga. 18" throat slitter.
No. 232 Bliss 12 ga. 18" throat slitter.
100 ton Adriance Straight Side, Single Crank, Single Acting. Back Geared Power Press, 2" stroke. 18 x 18 bed area.
#21 Bliss O.B.I. Press, 2½ stroke.
#21 Bliss O.B.I. Press, 2" stroke.
#216 Consolidated Double Acting, Cam Drawing Press, straight side, tie rod, 5" stroke.
Truesdale #19, similar Bliss #20.
Baxendale No. 4 and No. 3, comparable Bliss #20 and #19 O.B.I.
Manville #4 Perforating Press with roll feeds.
Bliss #2 Back Flywheel 1½" stroke (8).
Bliss #30 Arch Press, 2½" stroke.
Rockford #2 O.B.I. Press, weight 1800#, 2" stroke.

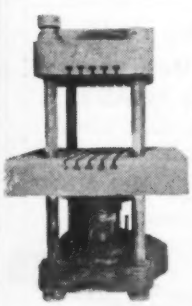
BENDING ROLLS

8' ⅝ cap. Pyramid Type Drop End Housing, Geared motor drive, 3 phase, 60 cycle, 440 volt.

#612D NIAGARA 200 TON PRESS



1—Niagara #612 D press. Straight side, double crank, back geared, 200 ton cap., 3" stroke, bed 60 x 38.



200 TON HYDRAULIC PRESS

American Car & Foundry upmoving ram; 4-column type; distance between columns 35" right to left, 24" front to back; daylight 34½"; minimum die space 22"; platens are made with 5 tee slots; bottom platen area 49" right to left, 36" front to back; cylinder 13⅛" diameter; 24" stroke; 2500# pressure capacity.

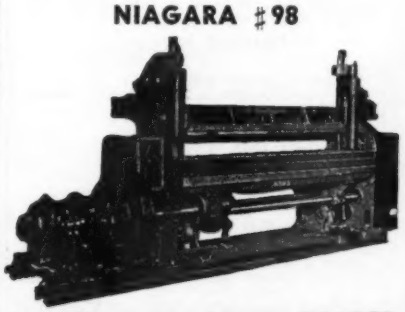
PLANERS

POND 72" x 72" x 18' table; 2 heads on rail, 2 side heads.
CINCINNATI 30" x 30" x 10' table, M.D.
PUTNAM 48" x 48" x 12' table, M.D.

PROFILERS

P. & W. No. 12 2-spindle motorized Profiler, Table 12" x 15" equip. with 6" rais. blocks, and 5 H.P., 3 ph. 60 cycle, 220 V. motor—Turner drive mounted and wired to push button control—rebuilt and guaranteed.

NIAGARA #98



HEAVY PRODUCTION FOLDER

6' x 14 gauge capacity. Ar. M.D.
Working length 72", cap. 14 gauge; min. width of fold at cap. 1" gaging range (narrow folds) ¾" to 1⅝", max. gaging range 72" left of chamfering bar 3". Shipping wt. 12,690 lbs. Like new.

15—6-SPINDLE AUTOMATICS—LIKE NEW

New Britain #61—1⅝" 6-spindle Automatics—3 equipped for bar work—12 equipped for second operation work. Machines are about 15 months old. Now available for immediate delivery. Equipment includes motors, chucks, collets, and tooling. Write, wire or phone Main 6347.

Buy From Stock

FALK MACHINERY CO.,

MACHINERY MERCHANTS

18 WARD ST.

Tel. Main 6347

ROCHESTER 5, N. Y.

. . . IN STOCK

AUTOMATICS

7/8" Gridley Model G, four spindle
1¼" Gridley Model F, four spindle
1¾" Gridley Model F, four spindle
⅝" National Acme, No. 515, four spindle
2¾" Cleveland Model A, single spindle
4" Cleveland Model A, single spindle

BROACHES

HO American Hydraulic, Horizontal
XB10 Oilgear Hydraulic, Horizontal

DRILLS

24" Colburn, single spindle
Barnes Camelback, single spindle, tapping
No. 17 Foote Burt, 2 spindle
Avey Sensitive, 3 spindle
Leland-Gifford, Sensitive, P.F., 3 spindle
Barnes Camelback, 4 spindle, 2 tapping

GEAR CUTTERS

No. 12 Barber Colman
No. 8 Fellows Gear Shaper
No. 3 Brown & Sharpe Automatic
96" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
No. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS

No. 3 Cincinnati Centerless
No. 16 Blanchard, 26" chuck
22' x 48" Pratt & Whitney Vertical Spindle Surface, Timken Bearing
30" Diamond Face, 84" Table Travel
10" x 72" Brown & Sharpe Cylindrical
No. 1 Cincinnati Tool & Cutter
No. 70 Heald Internal

LATHES

20" x 8' Sebastian, g.h.
14" x 6' Lodge & Shipley, c.d.
16" x 8' Hendey, c.d., yoke head
18" x 8' Lodge & Shipley, c.d.
36" x 20' Boye & Emmes, g.h.
8" x 60" Fitchburg Lo-Swing, g.h.

TURRET LATHES

No. 4 Warner & Swasey Universal, g.h.
No. 2 Acme Full Universal, g.h.
No. 2A Warner & Swasey, g.h.

MILLS

No. 1½ Brown & Sharpe Universal, s.p.d.
No. 3 Ryerson-Conradson Plain, s.p.d.
No. 12 Brown & Sharpe, c.d.
No. 6 Whitney Hand, c.d.
No. 3 Knight Vertical, s.p.d.
No. 2 Kempsmith Vertical Maximiller, m.d.
No. 3 Brown & Sharpe Vertical, s.p.d.
Model C Becker Vertical, s.p.d.
4" Pratt & Whitney Spline

MISCELLANEOUS

Cochrane-Bly Die Filing Machine
10' x 16 Ga. Ohl Squaring Shear
No. 8 Whiting Comb. Punch & Shear
No. 2 V & O Press, O.B.I.
No. P2 Ferracute Press
15 Ton Lucas Forcing Press, m.d.
268¼D Toledo Toggle Press
300 Ton Ferracute Double Crank Press

PLANERS & SHAPERS

16" American Crank Shaper, s.p.d.
20" Stockbridge Crank Shaper, c.d.
24" x 24" x 8' American Planer, m.d.
36" x 36" x 12' Niles Planer, m.d.
48" x 48" x 12' Cincinnati Planer, m.d.

RESTORE YOUR WORN MACHINES by having us rebuild them. We have a complete rebuilding department operated by men thoroughly trained in rebuilding. Your machines are taken down, carefully checked for wear, and worn parts are replaced, bearings and ways scraped and refitted. You'll find when rebuilt by us they'll perform like they did when they were new.

Write, Wire or Phone Us

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.

1959-69 South Meridian Street
INDIANAPOLIS, INDIANA

Eastern Branch:
44 WHITEHALL STREET, NEW YORK, N. Y.

EASTERN OFFERS FROM STOCK

ARBOR PRESSES

15 ton Lucas High Pattern Power Forcing
No. 2 Fameo
No. 4 Greenerd
Barnes Screw Press, hand operated
King Screw Press, s.p.d., 36" between housings

AUTOMATICS

2¼" Cleveland Model A, m.d.
2¾" Gridley Single Spindle, m.d.
2¾" Cleveland Model A, m.d.
3¾" Gridley Single Spindle, m.d.
4¾" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
4 spindle ⅝" Cleveland Model M, m.d.
No. 6D Potter & Johnson, m.d., for brake drum work
No. 22 New Britains, belt (3)
No. 33 New Britain, m.d. (2)

BOLT THREADING MACHINES

¾" Economy Automatic style B, belt
No. 11S Rickert-Shafer Automatic, m.d., cap. 1" x 36" max.
American Bolt Heading Machine, 1¼" cap.

HORIZONTAL BORING MILLS

3½" Bisnquist & Eck, m.d.
No. 0 Fosdick, 3" bar
No. 31 Lucas, 3" bar, column raised 1', with revolving table (3)
4" Barrett Double Spindle, m.d.
5½" bar Niles-Bement-Pond Horizontal, m.d.
2½" bar Sargent Floor Type, with floor plate 16' long by 4' wide

VERTICAL BORING MILLS

34" Colburn, 1 turret head, m.d.
42" Colburn, 2 swivel heads, m.d.
48" Cincinnati Rapid Production, m.d., 1 turret, 1 swivel head
42" Niles Car Wheel Borer, belt
48" Niles Car Wheel Borer, belt
10' Betts, m.d., 2 swivel heads on rail

BROACHING MACHINES

NEW Cincinnati Milling Mach. Co. Mill Broach, 10" spindle, m.d.
No. 2 LaPointe, belt
No. 2 LaPointe of Hudson, belt
No. 3B J. N. LaPointe Double, belt

RADIAL DRILLS

2' American Triple Geared, m.d.
2½' Carlton Sensitive, gear box
2½' Cincinnati Bickford, cone
3' American Sensitive, cone
3' Carlton Sensitive, cone
3' Cincinnati Bickford Plain, m.d. (2)
3' Fosdick Sensitive, s.p.d.
3' Western Plain, gear box
3½' Cincinnati Bickford Plain, m.d. (2)
4' American Triple Purpose m.d
4' Cincinnati Bickford Plain, m.d. (5)
4' Hammond Jack Knife
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, gear box
5' Niles-Bement-Pond Full Universal, gear box
5' Prentice Plain, m.d.
6' Niles-Bement-Pond Semi-Universal, m.d.
12'-36" column diameter American Triple Purpose Plain, arr. for m.d. on arm. Latest type machine, new in 1941

UPRIGHT DRILLS

22" Aurora, belt
22" Barnes All Geared Self-Oiling
24" Cincinnati Bickford, m.d. (6), tapping attach.
25" Superior
24" Hoefer
24" Milwaukee
30" Rich Heavy Duty, m.d
32" Superior, tapping
36" Prentice

GEAR CUTTERS & HOBBERS

No. 5M Adams Mfg. Hobber, m.d., latest type, 1 year old
Cross Gear Tooth Rounder, m.d.
16" Gould & Eberhardt Gear Cutter
18" Gleason Straight Tooth Bevel Gear Generator
No. 3-26" Cincinnati Gear Cutter
No. 3-26", 3-36", 3 Heavy, 4-36", 4-48", 6-60", 6-72" Brown & Sharpe Automatic Spur Gear Cutters
90" Gould & Eberhardt Gear Cutter
30" Brainerd Auto. Spur & Bevel Gear Cutter
No. 36BM 3 spindle Gould & Eberhardt Gear Rougher
12" Ingle Gear Tooth Rounder
Gleason Spiral Bevel Gear Rougher

More than 1,000 machines on our floor. Let us quote on your requirements.

The
EASTERN
MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI, OHIO

MOREY
Dependable Used Machines

BARNES No. 3 Horiz. Drill — M.D.
BULLARD 24" R.P. Boring Mill — With side head
G E 48" Gear Cutter
BILTON (STANDARD) #35G Gear Miller
GLEASON 10" Spiral Bevel Gear Gen.
GLEASON 3"-6"-18" Bevel Gear Gen.
HEALD No. 60 and No. 70 Internal Grinder motor drive
INGERSOLL 24" Cutter Grinder
LANDIS No. 3½ Int. Hyd. Race Grinder
AUTOMATIC MACHINE CO. 12"x4" Quick Return Taper and Relieving Type Lathe for manufacturing taps

DEFIANCE #25A Horiz. Boring Mill — 3¾" bar — Built in 1941
HEALD. No. 25A Rotary Surface Grinder — Hydraulic feeds with 24" rotary chuck
LANDIS 20"x220" Plain Grinder — Motor driven

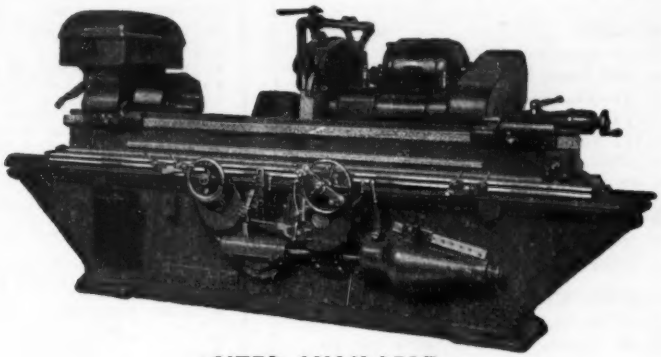
NATCO C-13 Hyd. Multiple Spindle Drill
ESPEN LUCAS No. 138 Cold Saw —Cap. 12"
ACME 1" All Steel Upsetter
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
GISHOLT Precision Balancer
LONG & ALSTATTER Angle Shears
LENNOX No. 1 Rotary Shear — Cap. ½"
AMERICAN 30"x30"x14" Planer 2 heads, M.D.
POTTER & JOHNSTON No. 6C Semi-Automatic
100 ton Hydraulic Forcing Press
Cincinnati Gear Burnisher — M.D.

100 Assorted Milling Machine Attachments
DIVIDING HEADS
Vertical-Slotting—Rack Cutting
for BROWN & SHARPE—CINCINNATI — KEARNEY & TRECKER — Le BLOND — HENDEY — OHIO — ROCKFORD — KEMPSMITH

THIS IS A PARTIAL LIST
Send us your specific inquiries

MOREY
MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

HILL-CLARKE
Modernized
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



SIZES AVAILABLE

10x36	10x72	14x72	16x72
10x50	14x50	14x96	18x96

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke Patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

649 WASHINGTON BOULEVARD — CHICAGO, ILL.

REBUILT PLANERS AND LATHES
AVAILABLE FOR IMMEDIATE INSPECTION AND DELIVERY

1—48"x36"x18' Detrick & Harvey Openside Planer
2—42"x42"x12' Pond Heavy Duty Double Housing Planers
1—36"x36"x12' Betts Heavy Duty Double Housing Planer
1—36"x36"x10' Gray Heavy Duty Double Housing Planer
1—24"x24"x 6' Gray Double Housing Planer
1—24"x12' Putnam Engine Lathe
1—20"x10' Flather Engine Lathe
1—20"x 6' Flather Engine Lathe
1—18"x 6' Monarch Engine Lathe

ATLANTIC MACHINERY CORPORATION

149 BROADWAY — NEW YORK, N. Y. — WOrth 2-0662

LATHES
36 x 30' LeBlond Geared Head M.D. Q.C.
26" x 10' Niles, Cone, Q.C.
18" x 8' Lodge & Shipley Q.C.
14" x 6' Lodge & Shipley Cone, Q.C.
20" x 9' Rahn Larmon, Cone, Q.C.

GRINDERS
Fitchburg Spline Shaft Grinder.
#55 Heald Cylinder.
Lees Bradner Gear Grinder.

GEAR MACHINERY
18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#6 Fellows Gear Shaper, Cullman M.D.
#645 Fellows Gear Shaper, Cullman M.D.

PLANERS
72" x 60" x 28' Pond 2 heads, Belt drive.
24" x 24" x 6' Gray Planer.
28" x 28" x 8' Whitcomb Blaisdell Planer.

RADIAL DRILLS
2½' American Plain, M.D.
3' American Sensitive.
3' American Plain.
3' Cincinnati Bickford Plain Radial Drill.
3' Dreses Plain Radial Motor on arm.
4' Carlton Plain Radial Drill.
6' American Triple Purpose Plain Radial.

MISCELLANEOUS
12 Ga. 30" Throat Quickwork Shear, M.D.
14" Niles Slotter.
1500# Bell Steam Hammer.
#4 Cincinnati Vert. High Power Mill M.D.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second Street, Cincinnati, Ohio

UNUSUAL VALUES

Belt Cutter 1" capacity, 3 spindle
Brake Robinson 5' toggle
Compressor-Quincy 4½ x 5 motor drive
Drill, new 10" Buffalo bench
Drill, ceiling suspended, unlimited drilling area
Drill Press, 20" three spindle Barnes
Drill, six-spindle Henry & Wright, 12" overhang
Drill, two spindle sensitive, #1 Morse taper
Grinder #20 Bryant deep hole internal
Grinder 60" plate
Grinder #60 Heald, cylinder
Grinder, Sellers Tool
Lathe, 14"x12' Lodge-Shipley grd. bd. s.c. mtr. dr.
Lathe, 24" x 18' Steptoe-McFarlan
Motors—new ⅓ to 30 HP-3 phase ball bearing
Press #8-7 Zah-Hahnemann straight side grd.
Punch & Shear ⅝" capacity Rock River
Punch & Shear, two ½" capacity
Threading Machine #0 Webster & Perks
Turret Lathe L & D brass, cross slide turret
Vacuum Cleaners, heavy duty for shop use

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

MISCELLANEOUS MACHINES

12 x 18" Cinch. Plunge Cut Grinder, m.d. with 9" face wheel, rebuilt.
3' Carlton Sensl. Radial with tapping att.
3' 9" col. American Enclosed Head Plain Radial Drill
4' Hammond Sensl. Radial, with tapper, m.d.
6' Niles Plain Radial Drill, m.d., rebuilt
2-spindle DEMCO High Speed, B.B. Drill, hand feed, ⅜" cap.
Gisholt Tool Grinder, arr. for m.d.
Oliver Tap Grinder, m.d.
12" Double End Warner & Swasey Key Lathe

STRONG, CARLISLE & HAMMOND CO.
1392 West 3d St., Cleveland, Ohio — 2832 East Grand Blvd., Detroit, Mich.

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PAUL'S MOTOR & MACHINERY SUPPLY
6111 Vermont Ave.
DETROIT, MICH.

NILES-BEMENT-POND Horizontal Boring, Drilling & Milling Machine, 4½" bar, duplex control, table-type, with auxiliary table, motor drive.

LANDIS 8" to 18" inclusive—Pipe Threading Machine, gear box, single pulley drive.

ALSO MANY OTHER TOOLS

ALEX ZEEVE & COMPANY
2289 Woolworth Building — New York, N. Y.

10" x 36" Norton Surface Grinder, hydraulic feed with 9" x 36" magnetic chuck, and 220 volt, 3 phase, 60 cycle motor. 1932 machine. Excellent condition.

D. E. DONY MACHINERY CO.
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SEARCHLIGHT SECTION

CAN SHIP FROM STOCK

MILLERS
1—#5 Cincinnati High Power
1—#5B Heavy Brown & Sharpe M.D.
2—#4—Cincinnati High Power
1—#2 Cincinnati High Power
1—#2 Van Norman
1—#30H. Sundstrand Rigidmil
8—Production Millers

GRINDERS
1—Modern, Cylindrical 16" x 60" M.D.
1—Diamond Surface 36" x 12" x 14"

BORING MILLS
1—4" Bar Bickford Horiz.
1—42" Baush, 2 swivel heads on rail

RADIAL DRILLS
1—5 ft. Cincinnati Bickford
1—6 ft. Niles Universal Arm.
1—4 ft. Cincinnati Bickford
1—5 ft. American Triple Purpose

AUTOMATICS
8—#00 Brown & Sharpe
1—6 spindle new Britain 1⅝" cap.

TURRET LATHES
1—4½ x 26" Libby
1—#4 Warner & Swasey
1—1" Woods Screw Mach.
1—1" Foster Screw Mach.

MISCELLANEOUS
Rafter 3,-5,-7, & 8 Head Metal Moulding and Rolling Machines
11" Gleason Gear Generator with lot of equipment

This is a partial list. Send us your inquiries. What have you to sell? Send us your list.

S. & S. MACHINERY CO.
207 Centre St., New York 13, N. Y.
Phone: WOrth 4-5710

BORING MILLS

10', 60" Niles Vert.
3½" Rochester, M.D.
4", 4½" Gisholt and Niles
54", 60" Colburn, M.D.
36" Niles, Bausch
36" Bullard V.T.L., M.D.
42" Bullard, M.D.
2½" Binsee, Universal, M.D.

CANAL MACHINERY COMPANY
176 LAFAYETTE STREET, NEW YORK, N.Y.

GRINDERS (10)
Internal, Universal

INTERNAL, UNIVERSAL BUILT 1943

(Like New)

Inquiries Solicited

Kings County Machinery Exch.
394 Atlantic Avenue
BROOKLYN 2, N. Y.

OTT MACHINERY SPECIALS

AUTOMATICS, Gridley, ⅝, 1¼ & 2¼" Model F
AUTOMATICS, Grindley, 2¼, 3¼, 4¼ & 5¼" Single Spindle, M.D.
AUTOMATICS, Cleveland, 1½, 2⅝ & 3⅝" Mod. A
AUTOMATICS, Cleveland, ⅞, 1¼, 2 & 2½" Mod B
AUTOMATICS, Cleveland, 1¼ & 1½", Mod. M. M.D.
AUTOMATICS, Potter & Johnston #5A & 6A
BORING MILLS, 42" Gisholt, 1 Turret & S.H.
BORING MILLS, Lucas Horiz. 3" bar M.D.
BORING MILLS, Rockford Horiz. Radial M.D.
GEAR HOBBERS, 12 Barber-Colman M.D.
GEAR SHAPERS, #7 High Speed, M.D.
GRINDERS, #2 Cincinnati Centerless
GRINDERS, Landis, #1 Universal
GRINDERS, Norton, 14 x 36" Plain, M.D.
LATHES, 16" x 6' Pratt & W. with Relieving Attach.
LATHE, Steinle Turret, 24 x 6¼" M.D.
LATHES, Warner & Swasey #2A & 3A, M.D.
MILLING MACHINE, #8 Becker Duplex, M.D.
MILLING MACHINES, Becker Vertical, Model S. D. 40" Rotary Table
MILLING MACHINE, Becker, Vertical, #3 & 5B
PLANERS, 42" x 42" x 12' Ohio, 1 Head, M.D.
PRESSES, Toledo, #34 Solid Back, S.G.
PRESSES, Bliss #64 S.S. Single Crank

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit, Mich.

LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of American Machinist, published every other Wednesday at New York for October 1, 1943.

State of New York }
County of New York } ss.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. A. Gerardi, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of American Machinist and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42nd St., New York City 18. Editor, Burnham Finney, 330 West 42nd St., New York City 18. Managing Editor, John Haydock, 330 West 42nd St., New York City 18. Business Manager, W. E. Kennedy, 330 West 42nd St., New York City 18.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

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4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is..... (This information is required from daily publications only.)

Secretary

McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 29th day of September, 1943.

[SEAL] EMILY Z. SHEPARD

Notary Public, New York County. N. Y. Clk's No. 768, N. Y. Co. Reg. No. 481275.
(My commission expires March 30, 1944)

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DEWITT TOOL COMPANY
173 Grand St. New York City

USED LATHES

BROWN & SHARPE ENGINE LATHE, 18" swing, 8 foot bed, with countershaft.
WHITCOMB BLAISDELL ENGINE LATHE, 15" swing, 6 foot bed, with taper attachment and countershaft.
Two AUTOMOBILE FLY WHEEL LATHES, individually driven, with ¾" H.P. 110-220 V., A.C. Motors.

THE CORLEY CO.
103 EAST MAIN ST., PLAINVILLE, CONN.

FOR SALE

25 TON, 1¼" Round Cold Rolled Steel Bars, 6" to 18" Long

We Buy Used Equipment

AMERICAN SALES CO.
1562 Harrison Ave., Cincinnati 14, Ohio

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28" x 12' **Pond lose change gear lathe**; 24" independent chuck.
42 x 36 x 10' **Woodward & Powell Planer**; two rail and two side heads.
52 x 46 x 14 **Gray Combination Planer and Grinder**; one rail head for planing; Excello spindle for grinding; hydraulic equipment; motors.
No. 4 **Brown & Sharpe Universal Grinder**; 12x60".
No. 14 **Pratt & Whitney Vertical Surface Grinder**; motorized; excellent tool.
18" **Gould & Eberhardt Gear Hobber.**
60" **Brown & Sharpe Gear Cutter.**
3-A **Warner & Swasey Turret Lathe**; boring tools.
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Automatic, No. 16 Gisholt Simplimatics
Chuckers, 4½" Gridley Model II, 4 spindle
Chuckers, 7" Baird 6 spindle
Cylinder borer, 3⅞" bar Beaman & Smith, horizontal
Boring Mill, 3" bar Universal, No. 3A
Brake, 10' Ohl 8" crank, 255 ton cap'y press brake
Broaches, Nos. 3 & 4 J. N. LaPointe
Compressor, 550 cu. ft. National 3 cylinder vertical
Compressor, 1400 cu. ft. Sullivan WN3
Drill, 30" Rich Tool Co., heavy duty
Drill, 20" Barnes A.G.S.O.
Drill, No. S 201 Barnes production
Drill, No. 16 Natco multi, 24 spdl.
Drill, Type 8H Natco horizontal
Drill, W. F. & J. Barnes vertical boring, reaming & drilling, hyd. feed
Drill, Rehnberg-Jacobsen, 16 spdl. production
Gear Cutter, 60", No. 5A Cincinnati spur
Gear shaper, ZI (No. 61) Fellows
Gear Hobber, No. 1 Lees Bradner Mfg.
Gear hobber, No. 16 HS Gould & Eberhardt
Grinder, No. 3 Cincinnati universal
Grinder, No. 84 Gardner, 24" opposed spindle
Grinder, Landis 10" x 48", 12" x 36", 16" x 52"
Grinder, Landis 16" x 32" & 16" x 48" crankpin
Grinder, 20" x 50" Safety Emery Wheel surface
Hammer, 100 lb. Bradley helve
Keyseater, No. 4 Mitts & Merrill
Lathe, turret, 26" Libby, 4½" hole
Lathe, turret, 2½", No. 9 Bardons & Oliver
Lathe, 36" x 16' Putnam heavy geared Bod.
Lathe, 4" x 36" Lo Swing, hardened ways
Lathe, 8" Sundstrand Stub
Lathe, 14" x 19" Fay automatic
Miller, Type C Hall Planetary thread
Miller, No. 3 Turn Millers
Miller, No. 3 Kempsmith plain
Miller, No. 3H Leblond heavy duty universal
Miller, Nos. 10 & 45, Productomatic
Miller, 30" Newton cont. rotary
Planer, 29" x 29" x 6' 3" New Haven
Planer, 24" x 24" x 6' Woodward & Powell
Press, No. 8-7 Zeh & Hahnemann str. side
Press, No. 33 Toledo arch
Presses, Nos. 180 & 796¼ D Toledo, toggle drawing
Presses, Nos. 201 & 203 General Flexible
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Riveters, Nos. 2A hy., 5½ B & 7B High Speed
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Rolls, No. R60 Yoder fender crown
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Shaper Planer, 26" Lynd Farquhar openside
Shears, 8" x 8" x 1" Long & Allstatter angle
Shears, 2" capy. Newbold guillotine
Slotter, 4" Garvin
Swager, No. 6 HS Langelier
Tapper, No. 2X Garvin
Threader, ¾" Economy automatic stud
Threader, 1" Landis 2 spdl.
Threader, 2" Landis bolt 2 spdl.
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MISCELLANEOUS

Casing coiler, ¾" No. 319 Sleeper & Hartley
Spring coiler, No. 5, ⅝" capy. Sleeper & Hartley
Hone, No. 211 Barnes
Lathe, Melling 6 cyl. crankshaft
Sand Mixer, Baker Perkins
Screw Driver, No. 61AA Bodine
Washer, Blakeslee metal
Threader, 1" Cleveland automatic double end
Gear checker, National Tool, for gears & cutters
Grinder, Cincinnati face milling cutter
Buffer, Hawes No. 575 for polishing
Die Casting Machine, A. C. Spark
Screw driver, Model C Detroit
Washer, Blakeslee, conveyor type

If you do not find the machine you need listed herein, mail us your inquiry and specifications. We may have or know of that very machine

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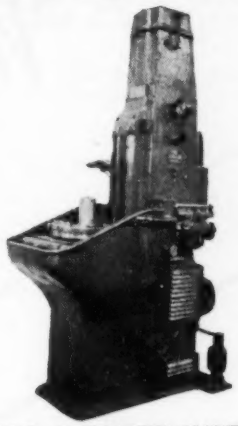

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Grinder, #2 Sellers Wet Tool, MD. (2)
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Lathe, 32" x 27' S.&B., TA; chuck.
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Lathe, 20" x 9' Cisco, DBG; QCG; chuck.
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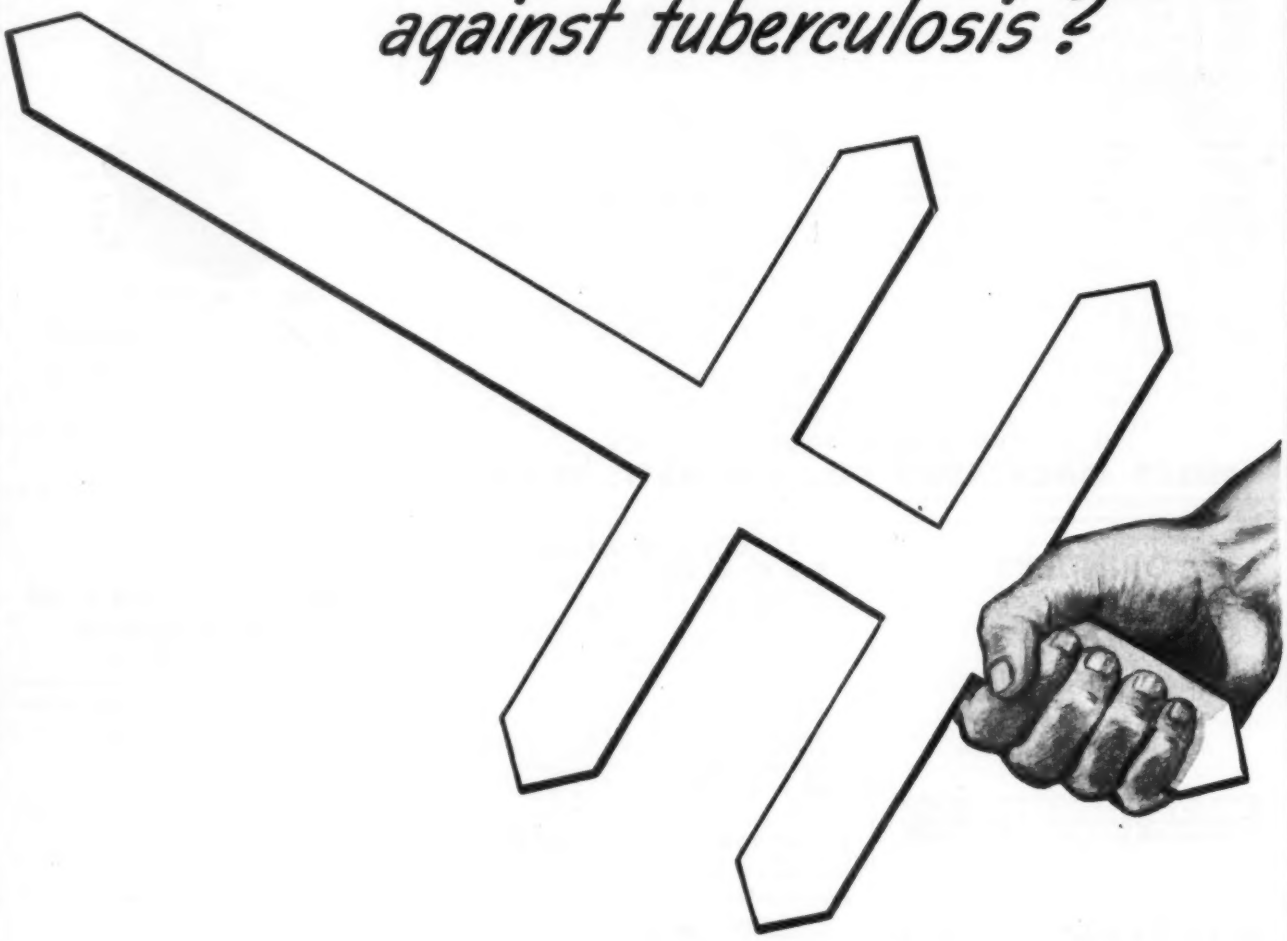

FIGHTING men say that attack is the best defense. And this holds true in the battle against our greatest unseen enemy—*the dread tuberculosis that still kills more people between the ages of 15 and 45 than any other disease.*

TB is no respecter of persons or homes—over night it may strike you, your family. One strong safeguard is your annual purchase of Christmas Seals, which has helped a gallant army of volunteer laymen and doctors cut the TB death rate by *seventy-five per cent* since 1904.

Your help is needed now to prevent a wartime rise in tuberculosis. To protect your home . . . and every home in America . . . send in your contribution, *today, please!*

BUY CHRISTMAS SEALS

Because of the importance of the above message, this space has been contributed by

American Machinist

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progress is non-stop . . .

American production, with the brakes off, is helping to produce the Victory. Then comes Peace. With it, world markets are only sixty hours from your shipping room door. Mr. and Mrs. China, Russia, Australia, India, Europe, South and Central America will have hospitable homes for the USA-made products of Peace. But don't let us kid ourselves. More and better goods for these millions must be made available for less. This in the face of high wages. A paradox? Hardly. Cost per unit goes down as production per man goes up. Pay more. Produce more. Sell more. Simple as ABC. Old, worn machine tools cannot produce efficiently, not efficiently enough for the products of the Peace World. Think about re-tooling now, for then.

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time to retool

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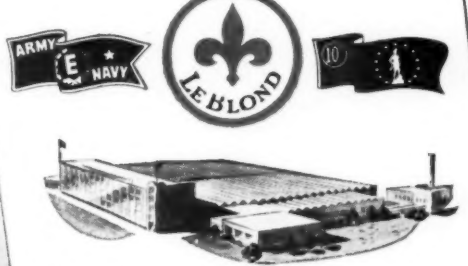

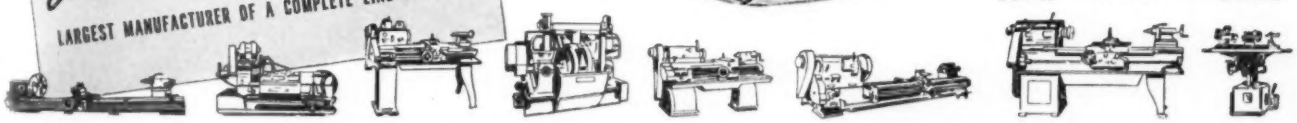

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- ☐ TOOL ROOM LATHES
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- ☐ HEAVY DUTY GEARED HEAD GAP LATHES
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- ☐ AUTOMATIC CRANKSHAFT LATHES
- ☐ No. 2 CUTTER GRINDER

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YOUR FIRM _____ ADDRESS _____

★ YOUR BONDS BUY BOMBS ★

BUY A "BLOCK-BUSTER" TODAY!

Precision

Timken Bearings

Manufactured by Greenlee Bros. & Co., Rockford, Ill.

Greenlee Automatic Indexing Machines like the one shown in the photograph are doing great work helping to produce the weapons of Victory.

The particular machine pictured here is equipped for drilling, boring and facing operations on supercharger housings for a famous American airplane engine—all calling for the utmost precision, as well as speed and smoothness. To make sure of it, every spindle is mounted on Timken Tapered Roller Bearings. Result, maximum rigidity—freedom from irregular operation and chatter under all conditions.

Practically all new machine spindles now are equipped with Timken Bearings—and in most cases they are used on all other headstock shafts as well. Machine manufacturers and users know it pays. The Timken Roller Bearing Company, Canton, Ohio.

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TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

Application of Timken Bearings on the spindles of Greenlee Automatic Indexing Machines.